Telephony.

VOLUME VIII. NUMBER 2.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

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CHICAGO, AUGUST, 1904.

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Headquarters for Express Switchboards

Chicago Telephone Supply Co.

THE GREAT MAIL ORDER FACTORY

NEW YORK ELKHART, INDIANA. SAN FRANCISCO

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Telephone Cords, Switchboard Cords and Cables are Manufactured and Guaranteed by us.

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RUNZEL-LENZ ELECTRIC MF'G. CO. CHICACO
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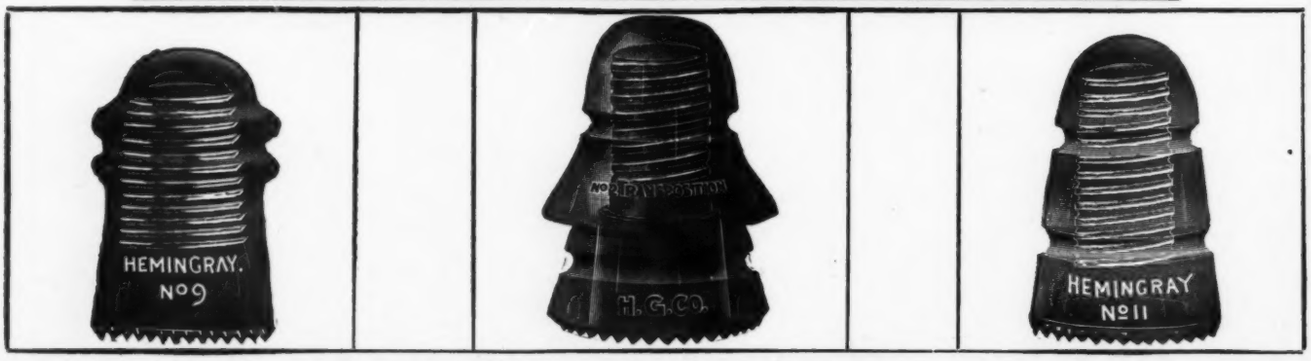
We Operate our New Plant employing Modern Methods and Insuring Excellent Product.

GET PRICES.

Tel. Main 4374.

RUNZEL-LENZ ELECTRIC MFG. CO.
97-101 So. Clinton St., Chicago.

THE STANDARD
"HEMINGRAY"
ALL WITH THE "PATENT DRIP PETTICOATS."



THE HEMINGRAY-GLASS CO.
Office, Covington, Ky. Factory, Muncie, Ind.
ESTABLISHED 1848

CHICAGO TELEPHONES SATISFY

CHICAGO TELEPHONES SATISFY

Consider what earnestness, what watchfulness and what tireless effort for improvement are implied by our circular design containing the words "Chicago Telephones Satisfy."

Chicago Telephone Supply Co.

CHICAGO TELEPHONES SATISFY

CHICAGO TELEPHONES SATISFY

THE GREAT MAIL ORDER FACTORY

NEW YORK **ELKHART, INDIANA.** SAN FRANCISCO

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We Want You to Send for Our New Telephone Catalogue

Our new building will soon be ready for occupancy. In it we will have facilities for handling a much larger trade than is possible at present. However, our stock rooms are replete with standard supplies of all kinds. We handle only the best material that money can purchase, and are always in position to fill orders promptly at the lowest prevailing market prices. We endeavor to ship goods same day orders are received. Our various departments are in charge of competent men. Our aim is to merit any confidence our patrons may repose in us. **The Columbian Telephones and Switchboards are installed in some of the largest Exchanges in the West. They are giving perfect satisfaction.**

AGENTS FOR—John A. Roeblings Son's Co. Telephone Wires
O. K. Weatherproof Telephone Wires
Rubber Covered Telephone Wires
Everything Electrical

COLUMBIAN ELECTRICAL COMPANY

Telephone No. 451 : : : ST. JOSEPH, MO., U. S. A.

The WARNER SWITCHBOARD { POWER GENERATOR

DRY BATTERY OUTFIT COMPLETE.

SAVES { TIME. MONEY. NERVES. **RESULTS** { BETTER SERVICE. SATISFIED CUSTOMERS. INCREASED BUSINESS.

COST FOR BATTERY RENEWALS LESS THAN 25c A MONTH PER 100 SUBSCRIBERS. . . . .

ONE OPERATOR { CAN ANSWER MORE CALLS USING OUR GENERATOR THAN TWO OPERATORS CAN USING HAND GENERATORS. . . .

LISTEN { NO BELTS TO BREAK. NO BEARINGS TO OIL. NO POWER BILLS TO PAY. NO MORE GENERATORS TO BUY.

Entirely Automatic. Requires Absolutely No Attention.

GUARANTEED TO DO ALL YOUR RINGING UNDER ANY AND ALL CONDITIONS.

We are furnishing this Generator for selective signaling, producing pulsating current, on all orders now.

CAN RING THROUGH 500,000 OHMS, IF NECESSARY.

Write Us. We will tell you all about it. Get our latest catalogue.

THERE IS NO LIMIT TO OUR GENERATOR.

MANUFACTURED EXCLUSIVELY BY THE

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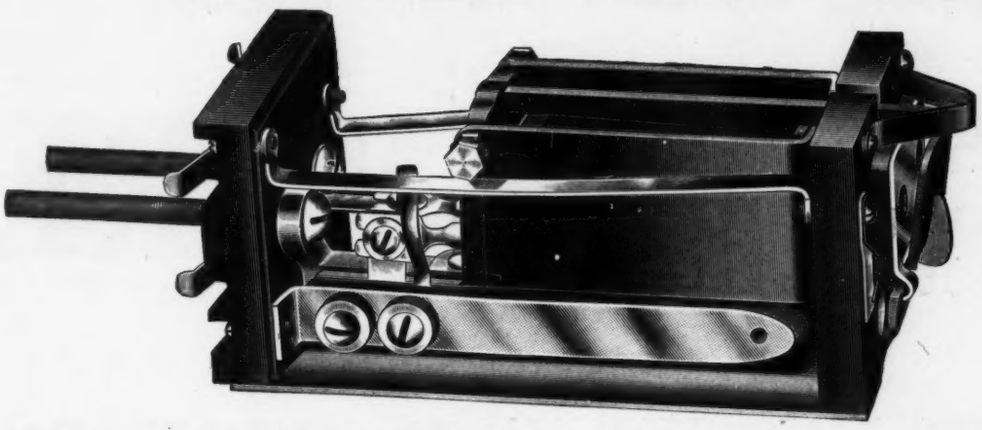
IMPROVED AMERICAN EXPRESS SWITCHBOARDS

BETTER THAN EVER



Manufactured under Patent Nos.

617,691
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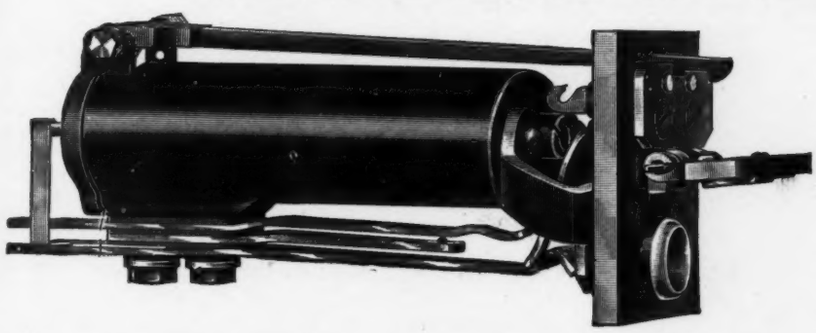
692,895
579,239

SELF-CONTAINED DROPS AND JACKS
RAPID RINGING DEVICE

All drops restored to normal position by withdrawal of plugs

SEE ALSO OUR
BELL-EXPRESS SWITCHBOARDS

Which are built with self-restoring drops and jacks in banks of 5 and 10



AT POPULAR PRICES

AMERICAN ELECTRIC TELEPHONE COMPANY

36-58 W. Jackson Blvd., CHICAGO

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Wouldn't That Jar You?

No! It couldn't if you were using our Pneumatic Telephone Receiver Cushion.

Send for one, you need it, price 50 cents each.

Interior Telephone
"Monarch" W. P. Iron
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Galvanized Messenger
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All are carried in stock by

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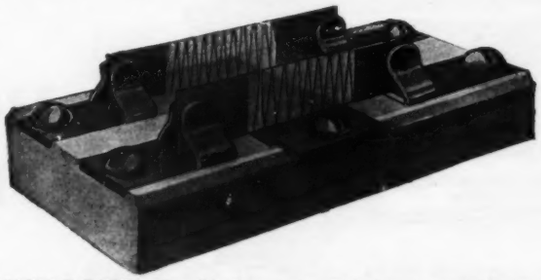
125-127 S. Clinton Street, Chicago, Ill.

OUR PROTECTORS PROTECT

TERMINAL HEADS
DISTRIBUTING BOARDS
CROSS CONNECTING BOARDS } With Patent Fuses

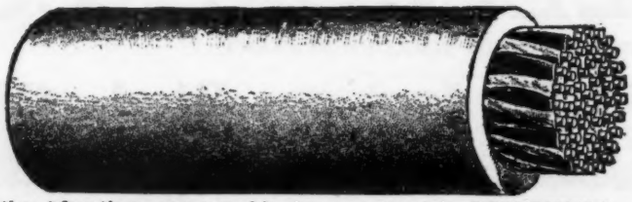
Construction Material. Large and Varied Stock. Prompt Shipment.



Telephone Instruments and Switch Boards

SAMPLE FREE. Any Exchange or Toll Line requesting sample fuse block may have one single or double line block mailed ABSOLUTELY FREE.

COMMERCIAL ELECTRICAL SUPPLY CO.,
1007-1009 Market St., ST. LOUIS, U. S. A.



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TELEPHONES

For Rural Lines, Exchanges, Magneto or Central Energy.

SWITCHBOARDS

Either Magneto or Central Energy in any capacity.

ALL ORDERS PROMPTLY SHIPPED

RESULTS

of a Satisfactory Nature Guaranteed.

When in the market get our prices and investigate our goods before buying elsewhere. . . . It will pay you to do so.

Swedish-American Telephone Company

CHICAGO .·. ILLINOIS

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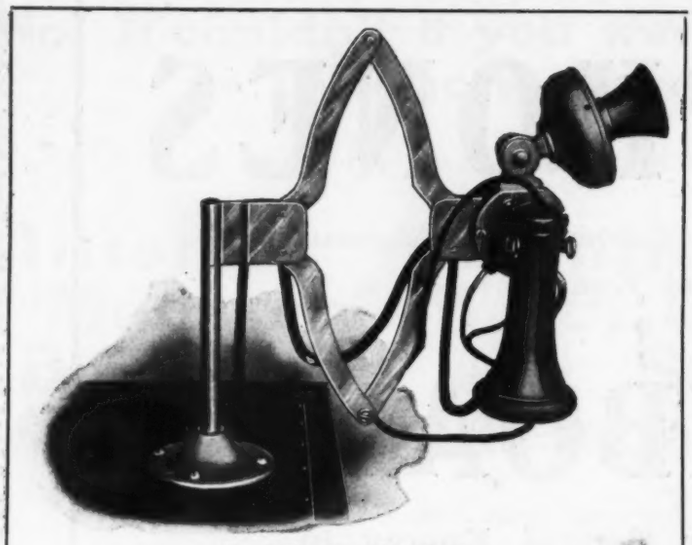
THE ADJUSTAPHONE



No. 5 For Flat Top Desk
(Suitable brackets for roll top desk and for wall are also furnished.)

affords perfect satisfaction to subscribers and costs no more to maintain than a wall set.

We furnish adjustaphones for any system either with or without transmitters and receivers, and ship them on free trial subject to return at our expense if not found entirely satisfactory.

Write for circular and prices.

Chicago Writing Machine Company

101 Wendell Street, CHICAGO, U. S. A.

Remember

That it is the detail that may make or break your System x x x

The wise buyer looks well into the merit of the small things that go to make up his exchange.

No. 1

No. 2

DON'T FAIL to Post Yourself Thoroughly on FUSES

We make a Fuse that Don't Fall to Pieces. Will Stand the Weather in Any Climate. Being Used by the Largest Telephone Companies in the United States.

The Nagel-Collins Mfg. Co.

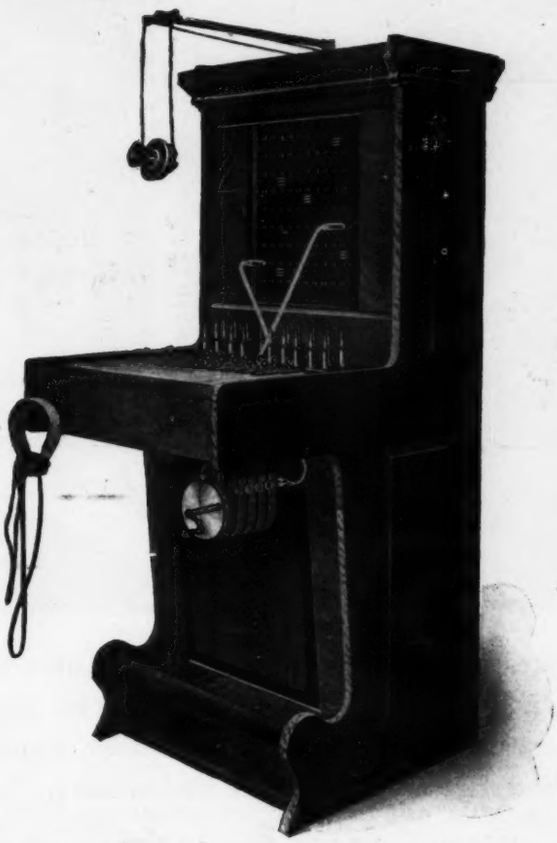
(NOT INCORPORATED)

249-251 SO. JEFFERSON STREET
CHICAGO, ILL.

CENTURY
100% GOOD

Century Type 5-A Switchboards for Common Battery or Magneto Systems Simple and Durable in Construction Efficient in Operation

We also manufacture Lamp Signal Common Battery Switchboards Both Multiple and Transfer Types



When used on Magneto System Signals are Electrically Restored

Lamp or Visual Signal Supervisory

Distributing Board in Back of Cabinet

Double Pilot System

All Century Telephones are Equipped with "PLATINUM ELECTRODE" Transmitters

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Century Telephone Construction Co.

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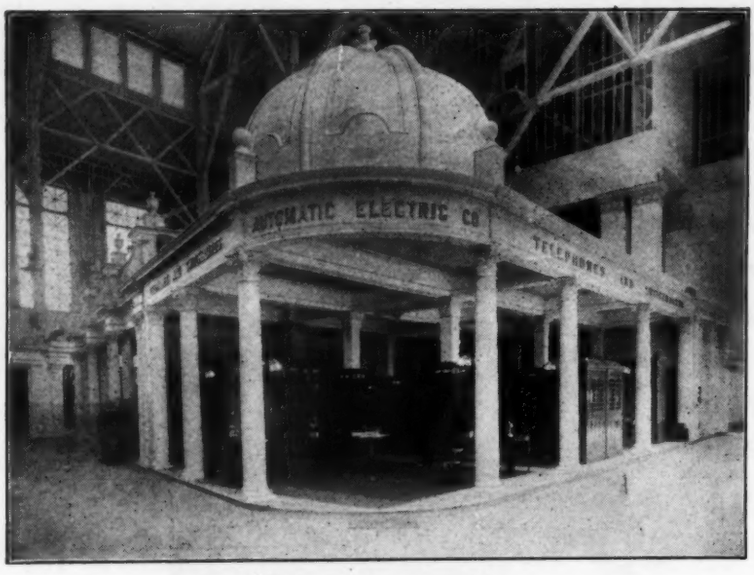
BUFFALO, N.Y.



The Automatic Telephone at St. Louis

Public Opinion

unites in declaring our display of Automatic Switchboards and Telephones at the St. Louis Exposition to be the most marvelous achievement of genius and science shown there.

We are exhibiting two 10,000 type Automatic Switchboards of 100 stations each, in our own pavilion, Section 24, Palace of Electricity. You are invited to visit us.

AUTOMATIC ELECTRIC CO.,
CHICAGO, U. S. A.

Where Automatic Telephones Are Made

Facts!

THE BEST EQUIPPED TELEPHONE FACTORY on earth, turning out the most advanced and reliable apparatus.

100,000 SQUARE FEET of manufacturing space.

CAPACITY—One Complete 500-Line Automatic Telephone Exchange per day.

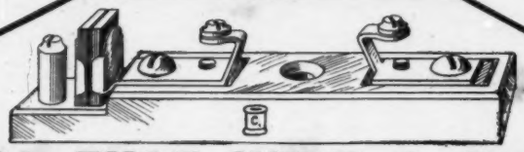
We almost manufacture Automatic Telephones and Switchboards automatically, so modern is our equipment.

AUTOMATIC ELECTRIC CO.
CHICAGO, U. S. A.

BEYOND A DOUBT

We are what we claim to be, the leading manufacturer of TESTED FUSE WIRE AND STRIP, FUSE LINKS, ENCLOSED FUSES, FUSIBLE LINKS, TUBULAR LINE FUSES, TELEPHONE FUSES AND BLOCKS, OUTLET BOXES, WIRE JOINTS. Write for Catalogue

TRADE MARK



CHICAGO FUSE WIRE & MFG. CO.

CHICAGO OFFICE: 358 Dearborn St. BUFFALO OFFICE: Mutual Life Bldg. NEW YORK OFFICE: 853 Broadway, New York

TELEPHONE BOOTHS
TELEPHONE BOOTHS

From the numerous re-orders received from Telephone Companies who have formed the habit of installing our booths, we judge the opinion prevails that that is the wise thing to do. Still there are a lot of fellows in the business who haven't ordered as yet and know not, therefore, what may be achieved in this particular, by forming one good habit.

Our booths are right and are safe to tie to.

YESBERA MFG. CO.
TOLEDO, OHIO

Telephone and Telegraph Wire

Made by continuous process from the best Rods obtainable. Possesses great Strength and high conductivity. Pliable, yet tough and uniform.

GUARANTEED STANDARD

Our Wire is known to the trade as, "Extra BB," "BB" and "Steel."

Your orders are earnestly solicited. Write for our quotations and Special Discounts.

Indiana Steel & Wire Co.
MUNCIE, INDIANA.

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THE PENDENT

THE PENDENT

BY HER LONESOME

THE PENDENT

"THAT DROPS FROM THE CEILING"

LET US ENUMERATE ITS TWENTY-FOUR EXCLUSIVE ADVANTAGES

THE VOUGHT-BERGER CO.

MAKERS OF FIRST-AWARD
TELEPHONES, SWITCHBOARDS AND APPLIANCES

LA CROSSE, WIS.

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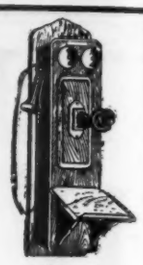
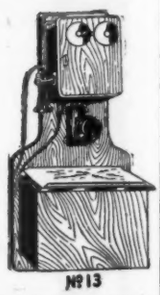
FARR TELEPHONES

TAKE THE LEAD for Durability, Fine Finish, Clear Talking and Loud Ringing.

OUR PRICES ARE RIGHT.





TELEPHONE SUPPLIES AND TOOLS, GET OUR PRICES ON

Wire Brackets, Pins, Cross Arms, Glass Insulatros. Can save you money.
We are outside the Trades Association. Bookkeeping blanks and ledgers free with a $10.00 order.

FARR TELEPHONE AND CONSTRUCTION SUPPLY CO.

118 and 120 W. JACKSON BLVD., CHICAGO.

Yes, a Telephone on Thirty Days' Trial!

We know words can't describe the efficiency and beauty of this instrument; therefore, we are willing to let you see it, because it can then be better appreciated. The woodwork is of handsome design and finish. The generator, transmitter and receiver are mechanically perfect, and electrically correct, and our guarantee on this instrument goes on forever. It is not simply a guarantee for a week, a month or a year, but at any time after you have purchased this instrument we will replace any part that should prove defective, when operating under proper management and normal conditions.

Isn't this a pretty clever offer? We will send it on trial, free. Examine it, test it, and then if we are not correct in our statements, send it back and we will pay the charges. Our prices are right too.

Ewing-Merkle Electric Company,

St. Louis, U. S. A.

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The "LORIMER"

The SYSTEM of the FUTURE

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Great Britain	New Zealand
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Belgian	New So. Wales
Italy	Queensland
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India	Austria
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Patents Pending

Germany	Japan
Norway	United States (5)
Russia	

THE AMERICAN MACHINE TELEPHONE CO., LT'D
Piqua, Ohio and Brantford, Canada

THE CANADIAN MACHINE TELEPHONE CO., LT'D
Toronto Canada

Cut-Down Your Expense

BY USING

Okonite Wires and Cables.

The man who installs OKONITE will save its cost in a comparatively short time. With OKONITE there is less "trouble shooting." It lasts longer and is more reliable than any other rubber covered wire on the market.

Our Stock of Construction Material is also complete, our prices attractive and you are assured of prompt shipment.

SEND US A TRIAL ORDER.

Central Electric Company

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WORLD'S FAIR ART CATALOGUE ... NOW READY ... MAILED FREE ON REQUEST.

TELEPHONE INSTRUMENTS

TELEPHONE SUPPLIES

PALACE OF TRANSPORTATION

CENTRAL TELEPHONE & ELECTRIC CO. Manufacturers of High-Grade Telephone Apparatus Dealers in Everything Used with Telephones *909 Market St., St. Louis, U.S.A.*

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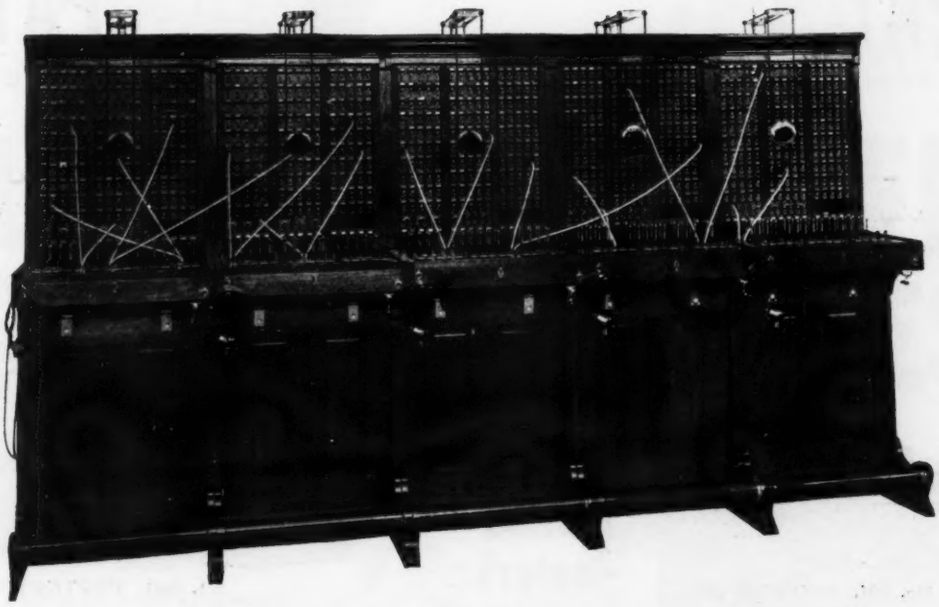
STANDARD TELEPHONE AND ELECTRIC CO.

OFFICES AND FACTORY, MICHIGAN AND JEFFERSON STREETS

MILWAUKEE, WISCONSIN



STANDARD No. 120 SWITCHBOARD--750 LINES

WRITE FOR DESCRIPTIVE MATTER ON ALL LINES OF TELEPHONE APPARATUS

"STANDARD" TELEPHONES AND SWITCHBOARDS

ARE OF THE LATEST UP TO DATE TYPES. PERFECT IN DESIGN AND FINISH.

ALL APPARATUS GUARANTEED

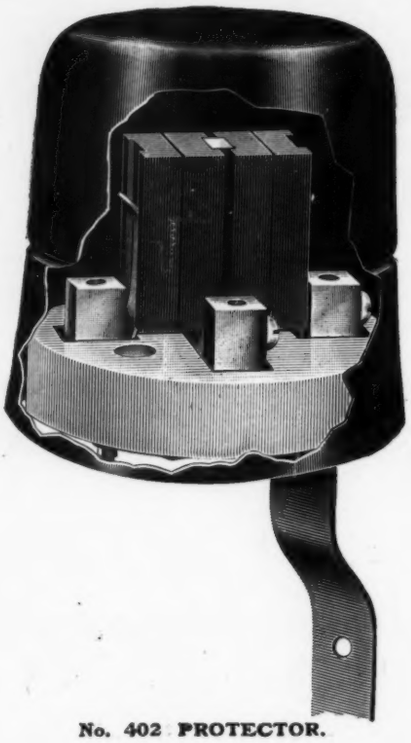
WRITE FOR PRICES **PROMPT SHIPMENTS**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

We shipped a **carload** of Mica fuses in May.

We have sold so far this year over **two million** American connectors for copper and iron wire.

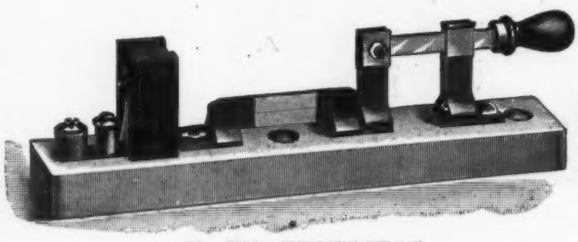
AMERICAN SPECIALTIES PAY



No. 402 PROTECTOR.

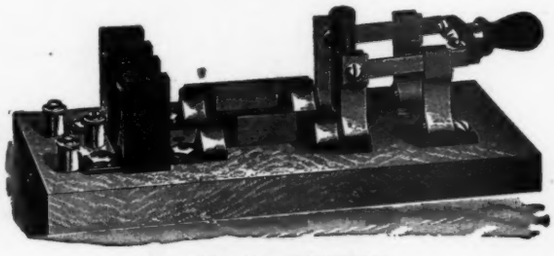
AMERICAN SPECIALTIES PAY

The No. 402 protector is designed for use outside. It has rust-proof cover, large self cleaning carbons, heavy, hollow binding posts, mounted on porcelain base. Wires connected from the bottom. A perfect outside protector.



No. 501. PROTECTOR.

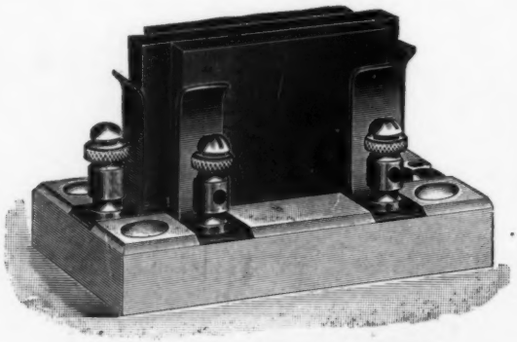
Our Protectors Protect.



No. 500. PROTECTOR.

No. 501 (single pole) and No. 500 (double pole) are the most satisfactory protectors for farmer or party line use. They combine a switch, fuse block and lightning arrester. Porcelain base.

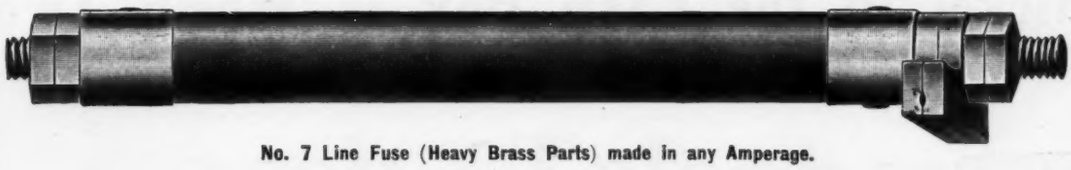
American Electric Fuse Co.



No. 400. LIGHTNING ARRESTER.

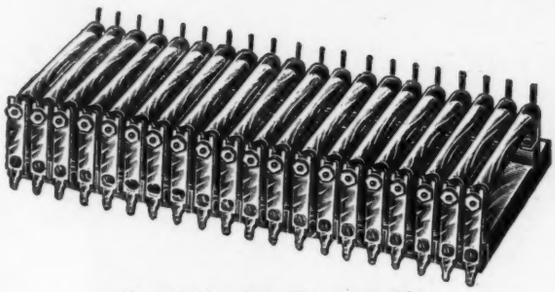
The best protector for toll line use.

Chicago New York Atlanta



No. 7 Line Fuse (Heavy Brass Parts) made in any Amperage.

No. 10 Line Fuse. Made for No. 12 and No. 24 Protectors shown below

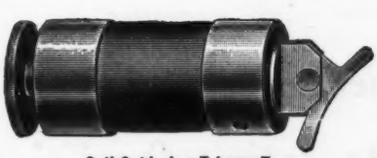


No. 12 Line Fuse Protectors, Plain

No. 24 Line Fuse Protectors with Carbon Lightning Arrester

ALL KINDS OF FUSE BLOCKS AND FUSES

A Self-Soldering Cartridge Dissected



Self-Soldering Trigger Type Cartridge Before Operating

Get a Sample

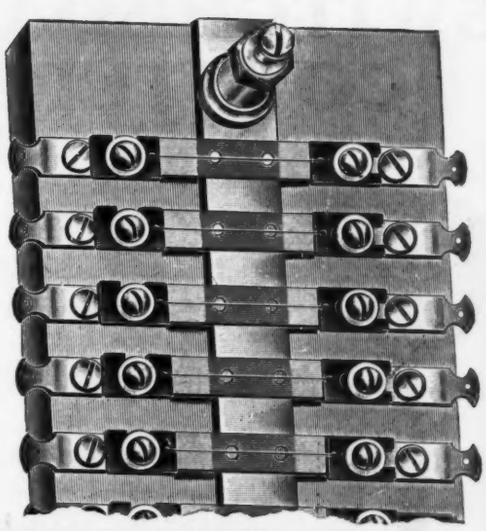
It Repairs Itself

Self-Soldering Trigger Type Cartridge After Operating

Sneak Current Protectors.

Distributing Boards

Cable Heads



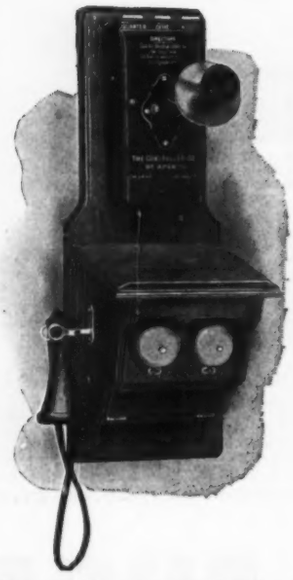
No. 136. Cable Protector with Mica Fuses and Center Plate Lightning Arrester.

AMERICAN ELECTRIC FUSE CO.

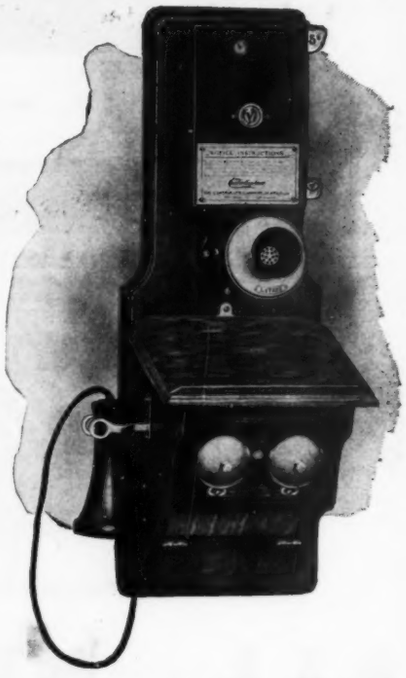
CHICAGO
NEW YORK
ATLANTA

OUR PROTECTORS PROTECT

A Nickel in the Cash Box is Worth Two on the Books.



You can reduce your operating and manufacturing expense, while increasing the revenues by the liberal use of coin controlled telephones.



Write for Booklet Deadheads vs. Dividends. It's worth reading.

The Controller Company of America, 1061 Monadnock Block, Chicago.

VEEDER SWITCHBOARD COUNTERS

(STYLE 8)

Show rate of increase, so that exact calculations for the future may be made.

They likewise show how better to divide the work on the board among the operators.

Number of calls during each hour of the day can be shown. Interesting statistics are easily obtained by their use. Sockets fit in keyboard permanently. Counter can be inserted or removed at will.

Free Booklet describing 10 styles of Counters.

THE VEEDER MFG. CO.

No. 1 Sargeant St., HARTFORD, CONN.

Cyclometers, Odometers, Tachometers, Counters, and Fine Castings.

TELEPHONES and SWITCHBOARDS

Second Hand but Reconstructed

in a manner which guarantees

Original Appearance and Operating Qualities.

One Thousand Exchanges are purchasing reliable apparatus of this Company at reduced prices.

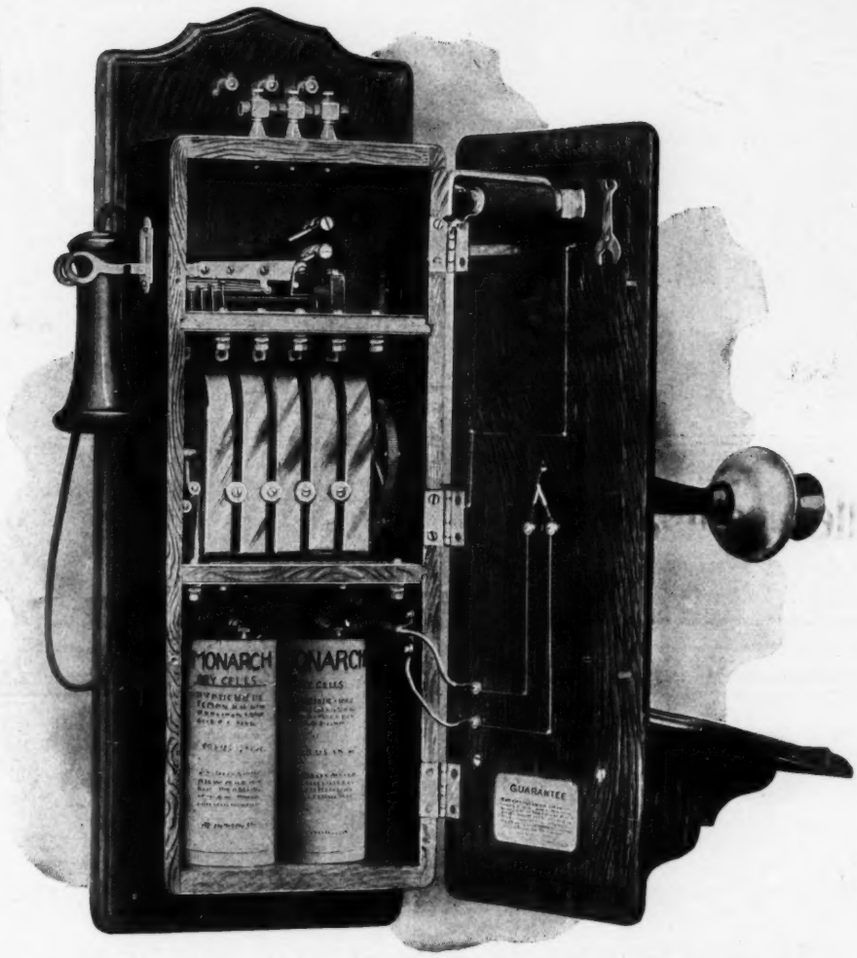
Why not You?

Write for Stock List. All Standard and Modern Makes.

Guarantee Telephone and Equipment Co.

73 & 75 W. Jackson Boulevard, CHICAGO, ILL.

NO ROOM FOR DOUBT IN Monarch Telephones



Every operation is done a little better than is absolutely necessary, and every piece of material is a little finer than would seem to be required. There is no cheapening at the expense of quality. This is what makes Monarch Telephones just what progressive telephone men are seeking—durable and efficient telephones.

FOR FULL PARTICULARS WRITE FOR CATALOGUE AND PRICES.

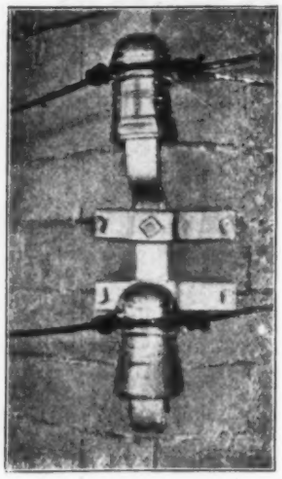
MONARCH TELEPHONE MFG. CO.

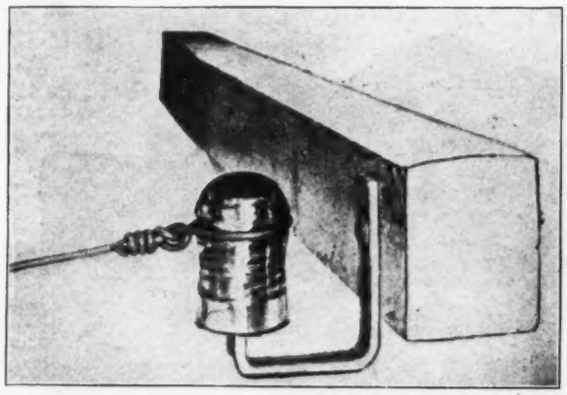
12-16 South Clinton Street Chicago, Illinois

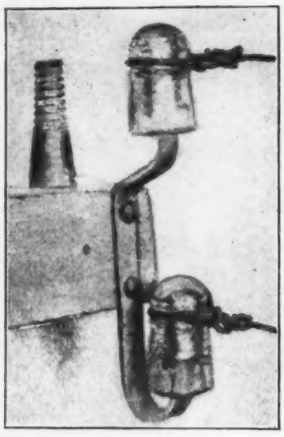
Please tell the Advertiser you saw his Announcement in TELEPHONY.

THE HALLETT IRON WORKS

92-96 West Polk Street, Chicago, Ill.







Wires well put up make no trouble. Knobs and such things make poor work. Use our Terminal Arm Bracket at cable poles and our Universal Iron everywhere else.

WE CARRY IN STOCK

everything necessary for the construction, maintenance and operation of any sized telephone system

We have built our present large business by careful attention to orders, prompt shipments, low prices and standard supplies Send us a trial order

ILLINOIS ELECTRIC CO.

THE MODERN ELECTRICAL SUPPLY HOUSE CHICAGO

CN 174

NOTICE the quality of NORTH telephones. They are built for wear and are known for the good character of service rendered. Repair bills on these telephones are rare and never become a serious matter.

OUR apparatus is not only easy of access, but all parts are built on the interchangeable basis, making repairs quick as well as inexpensive. Inspectors never slight their work on NORTH telephones because they are so easy to fix.

REGULAR types of telephone apparatus of all kinds are furnished by The NORTH Electric Co., as well as many kinds not made by others. We furnish COMPLETE SYSTEMS for all classes of telephone service.

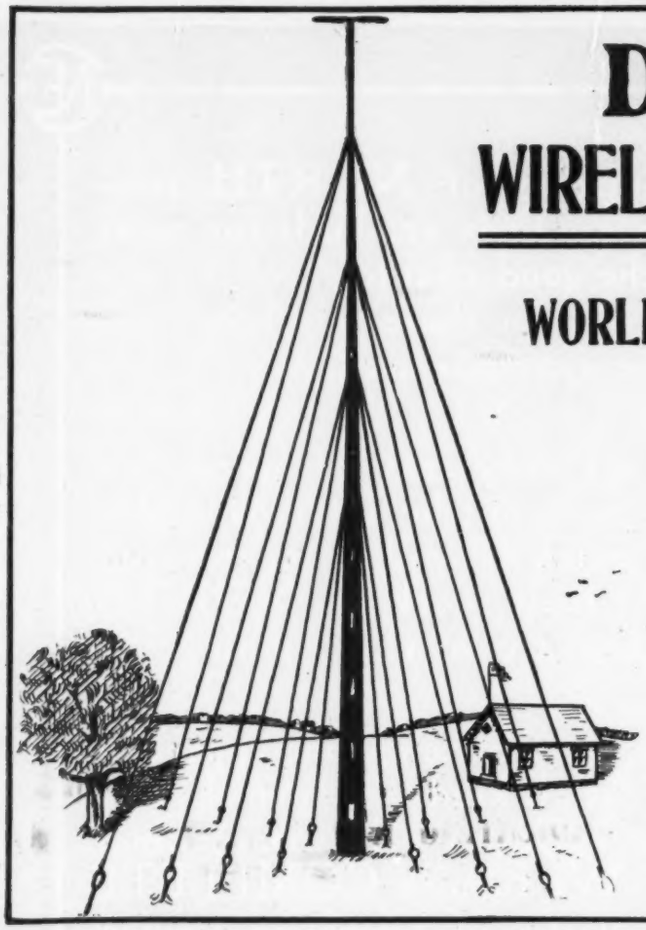
TALK does not make good equipment. We let ours speak for itself—also those who use it. They compare other makes to that of the NORTH Electric Co. when speaking of quality and excellence of service.

HONESTY in make-up is the motto of our telephone apparatus—it is likewise characteristic of our treatment of customers. This is why we can guarantee our goods—and why our guarantee is considered good.

We Have Catalogs—Sent Free on Request.

The NORTH Electric Co.

CLEVELAND, O., U. S. A.



DE FORREST
WIRELESS TELEGRAPH STATION

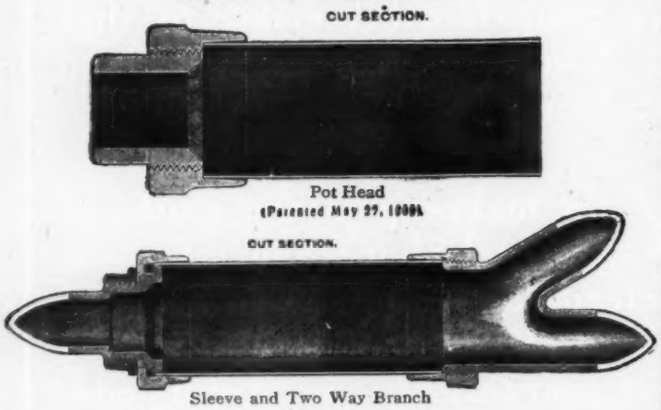
WORLD'S FAIR GROUNDS, ST. LOUIS, MO.

This great mast is 210 feet high, held in place by our No. 5 Guy Anchors. These anchors are 10x25 inches, fitted with rods nine feet long, one inch in diameter, and are set eight feet deep. They stand a strain of 40,000 pounds each.

"THEY NEVER PULL UP"

THE MILLER ANCHOR COMPANY
Write for prices. **NORWALK, OHIO**

"Security" Pot Heads, Sleeves and Branches



Sleeve and Two Way Branch

An economical necessity in Telephone Cable Construction Work.

SAVE MONEY
INSURE PERFECT WORK
INSTALLED BY ANYBODY
Send for Specialty Bulletin T33

Telephone Wire

We carry in Toledo Stock in quantity all kinds of Telephone Wires. Prompt shipments a specialty.

G. & B. Duplex (No. 19 Bull Frog Brand). We originated this high-grade wire, which has proven so popular.

Flame Proof Wire (No. 20 and 22). For Telephone Switchboards. Positively is not inflammable. Made Duplex or Triplex.

Send for Wire Bulletin W6.

Manufacturers and Jobbers of Telephone Supplies

THE F. BISSELL COMPANY,
TOLEDO, O.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

THE LATEST IMPROVEMENTS

In Generator-Call Telephones

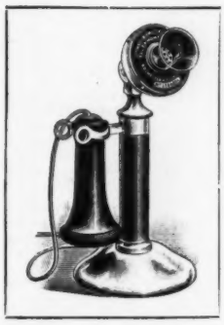
You Will find in Our New Bulletin No. 11-C.

YOU WILL FIND

OUR NEW DESK SET

OUR "SURE RING" TELEPHONE

This will please your party line subscribers, and at the same time relieve you of much trouble.



YOU WILL FIND

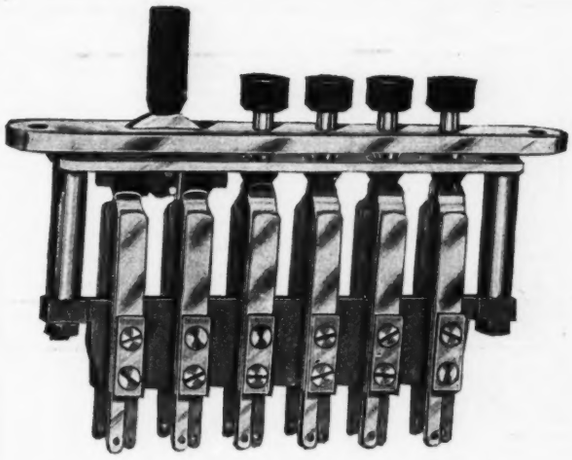
OUR FOUR-PARTY SELECTIVE TELEPHONE

OUR PARTY-LINE TELEPHONE

That enables a subscriber to ring central without ringing the other subscribers or ring a subscriber and not disturb central.

OUR FOUR-PARTY SELECTIVE INDICATING KEY

Simple and Easily Operated.



Construction and Material the Very Best.

Has a talking circuit as free from contacts as an ordinary metallic circuit ringing key. Cam lever used for ringing. Buttons used only for selecting proper ringing current. Button after being depressed to locking position remains in that position until another button is operated or until cam lever is thrown into listening position.

We will gladly mail printed matter describing this key, also our four-party master keys.

Stromberg-Carlson Telephone Mfg. Co.,

Gen'l and Eastern Sales Office:
ROCHESTER, N. Y.

Sales Department:
CHICAGO, ILLINOIS.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

OSCAR WENTWORTH ROGERS' ESTIMATES FOR TELEPHONE PLANTS IN IOWA

FALLER AUTOMATIC OPERATOR. ALL LINES UNDERGROUND.

ITEMS	Place	Over 25,000, under 50,000			Over 10,000, under 25,000			Over 5,000, under 10,000			Over 2,000, under 5,000		
	Des Moines (62139)	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant	TOWNS		Proposed Plant
	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't	Name	Popul'n	Acc't
		Dubuque	36,297		Burlington	23,201		Ft. Madison	9,278		Albia	2,889	
		Davenport	35,254		Clinton	22,698		Oskaloosa	9,212		Algona	2,911	
Business Phones	1,000	Sioux City	33,111	800	Ft. Dodge	12,162	500	Boone	8,880	250	Ames	2,422	
Residence Phones	2,000	Council Bluffs	25,802	1,700	Keokuk	14,611	1,000	Iowa City	7,987	500	Anamosa	2,891	100
Business Rates	15	Cedar Rapids	25,656	15	Marshalltown	11,544	15	Creston	7,752	15	Bellle Plaine	3,283	30
Residence Rates	10		156,120	10	Muscatine	14,073	10	Mason City	6,746	10	Bloomfield	2,105	15
Av. Length Lines	½m.			½m.	Ottumwa	18,197	½m.	Cedar Falls	5,319	½m.	Carroll	2,882	10
Percentage Conduits	100			100	Waterloo	12,580		Centerville	5,256		Chariton	3,989	½m.
Connectors per 100 Subscribers						129,096	100	Oelwein	5,142		Charles City	4,227	
								Atlantic	5,046	100	Cherokee	3,865	100
									70,618		Clarinda	3,276	
											Colfax	2,033	
											Corning	2,145	
											Cresco	2,806	
											Decorah	3,246	
											Denison	2,771	
											Eagle Grove	3,557	
											Eldora	2,233	
											Emmettsburg	2,361	
											Estherville	3,227	
											Fairfield	4,689	
											Glenwood	3,040	
											Grinnell	3,860	
											Hamburg	2,079	
											Hampton	2,727	
											Harlan	2,422	
											Independence	3,656	
											Indianola	3,261	
											Iowa Falls	2,840	
											Jefferson	2,601	
											Knoxville	3,131	
											Lake City	2,703	
											La Mars	4,146	
											Manchester	2,887	
											Maquoketa	3,777	
											Marengo	2,007	
											Marion	4,102	
											Missouri Valley	4,010	
											Monticello	2,104	
											Mt. Pleasant	4,109	
											Nevada	2,472	
											New Hampton	2,339	
											Newton	3,682	
											Osage	2,734	
											Osceola	2,525	
											Pella	2,623	
											Perry	3,986	
											Red Oak	4,355	
											Sac City	2,079	
ESTIMATED COST													
Central Equipment	$ 60,000												
Subscribers' "													
Building	5,000												
Conduits	25,000												
Armoured Cables	38,876												
Manholes	4,600												
Engineering Exps.	10,000												
Contingencies	5,000												
Distributing, &c.	36,000												
Total	$182,476			152,065			91,238			45,619			24,360
											Sheldon	2,282	
											Shanandoah	3,573	
											Spencer	3,095	
											Storm Lake	2,169	
											Speart	2,079	
											Tama	2,649	
											Tipton	2,513	
											Villisca	2,211	
											Vinton	3,499	
											Washington	4,255	
											Waukon	2,153	
Capitalization per Phone	61			61			61				Waverly	3,177	61
											Webster City	4,613	
DEPRECIATION											What Cheer	2,746	
											Winterset	3,039	
Conduits, 3%	3,524											194,188	
Other Plant, 6%	3,600												
Total	$7,124			5,940			3,562			1,781			960
EXPENSES													
Engineer and Manager	1,500												
Assistant	720												
Sec.-Tr. and Bookkeeper	900												
Storekeeper	360												
Stenographer	960												
4 Inspectors @ $60	2,880												
Heat, Light, &c	1,000												
Total	$8,320			6,950			4,160			2,750			1,500
SUMMARY													
Revenue	35,000			29,000			17,500			8,750			4,500
5% on Capital	14,598			12,165			7,299			3,650			1,948
Depreciation	7,124			5,940			3,562			1,781			960
Expenses	8,320			6,950			4,160			2,750			1,500
Surplus	4,958			3,945			2,479			569			92

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN IOWA

FALLER AUTOMATIC OPERATOR. ALL LINES UNDERGROUND.

Over 1,000, under 2,000

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Ackley	1,445	
Adel	1,2.3	
Afton	1,178	75
Akron	1,029	125
Alton	1,009	15
Audubon	1,866	10
Avoca	1,627	½m.
Bedford	1,977	½m.
Bellevue	1,607	
Belmond	1,234	100
Britt	1,540	
Brooklyn	1,188	
Calmar	1,003	
Cascade	1,266	
Cincinnati	1,212	
Clarion	1,475	
Clear Lake	1,706	
Columbus Jct.	1,099	
Coon Rapids	1,017	
Corydon	1,477	
De Witt	1,383	
Dunlap	1,355	
Dyersville	1,323	
Eddyville	1,253	
Eldon	1,850	
Elkader	1,321	
Farmington	1,332	
Fayette	1,315	
Fonda	1,180	
Forest City	1,758	
Garner	1,283	
Grand Jct.	1,113	
Greene	1,192	
Greenfield	1,300	
Grundy Center	1,322	
Guthrie Center	1,193	
Guttenberg	1,620	
Hartley	1,006	
Hawarden	1,810	
Hedrick	1,035	
Humboldt	1,474	
Ida Grove	1,967	
Keosauqua	1,117	
Lake Mills	1,293	
Lamont	1,540	
Lansing	1,438	
La Porte	1,419	
Lenox	1,014	
Leon	1,905	
		12,180
Logan	1,377	
Lucas	1,192	
McGregor	1,498	
Madrid	1,021	
Malvern	1,166	
Manning	1,169	
Manson	1,424	
Mapleton	1,099	
Montezuma	1,210	
Moulton	1,420	
Mt. Ayr	1,729	61
Mt. Vernon	1,620	
Mystic	1,738	
Nashua	1,263	
New London	1,093	
New Sharon	1,252	
Nora Springs	1,209	
		480
Northwood	1,271	
Odebolt	1,432	
Onawa	1,933	
Orange City	1,457	
Parkersburg	1,164	
Rhinebeck	1,303	
Rockford	1,080	
Rock Rapids	1,776	
Rock Valley	1,054	
Rockwell City	1,222	
Sabula	1,029	
Sanborn	1,249	
Seymour	1,703	
Sibley	1,289	
Sidney	1,143	
Sigourney	1,952	
Sioux Rapids	1,005	
Spirit Lake	1,219	
State Center	1,008	
Story City	1,197	
Strawberry Pt.	1,012	
Sumner	1,437	
		863
Toledo	1,941	
Traer	1,458	
Valley Jct.	1,700	
Wapello	1,393	
W. Burlington	1,044	
W. Liberty	1,690	
West Union	1,935	
Williamsburg	1,100	
Wilton	1,333	
Woodbine	1,585	
	133,124	
		2,375
		975
		480
		863
		57

Over 500, under 1,000

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Adair	878	
Alden	709	
Allerton	950	30
Alta	561	70
Anita	968	15
Arlington	863	10
Armstrong	907	½m.
Ashton	513	
Aurelia	621	
Bancroft	839	100
Batavia	533	
Battle Creek	542	
Beacon	953	
Birmingham	922	
Blairstown	592	
Blanchard	520	
Blockton	704	
Bonaparte	898	
Brighton	807	
Buffalo Center	875	
Burt	504	
Bussey	550	
Comanche	713	
Cambridge	667	
Carlisle	553	
Carson	632	
Casey	568	
Center Point	674	
Central City	623	
Charter Oak	772	
Churdan	626	
Clarence	675	
Clarksville	849	
Clearfield	698	
Clermont	513	
Coin	574	
College Springs	693	
Colling	540	
Correctionville	935	
Corwith	651	
Cumberland	591	
Dallas Center	625	
Davis City	617	
Dayton	753	
Delmar	592	
Delta	691	
Dexter	795	
Doon	545	
Dows	818	
		6,090
Durant	560	
Dysart	902	
Earlham	630	
Earlville	618	
Early	579	
Edgewood	565	
Elgin	635	
Elliott	516	
Elma	976	
Emerson	502	
Epworth	549	
Essex	710	
Extra	851	
Fairbank	644	
Farley	513	
Farragut	514	
Fontanelle	853	
		240
Fredericksburg	565	
Fremont	542	
Garden Grove	651	
Gilmore City	687	
Gladbrook	842	
Glidden	783	
Goldfield	628	
Gowrie	681	
Gravity	549	
Griswold	900	
Hamilton	538	
Hawkeye	518	
Hazelton	500	
Holstein	870	
Hopkinton	767	
Hubbard	676	
Hull	626	
Hunneston	945	
Ireton	545	
Jesup	690	
Jewel	947	
Kalona	530	
		400
Kellogg	653	
Keota	996	
Kingsley	720	
Lake Park	541	
Lake View	591	
Lamont	636	
Laurens	853	
Lawler	646	
Le Claire	997	
Lehigh	806	
Lewis	613	
Limesprings	605	
Linesville	690	
Lisbon	956	1,150
Livermore	618	487
Lohrville	597	240
	42,760	400
		23

TOWNS		Proposed Plant
Name	Popul'n	Acc't
Lone Tree	600	
Lorimer	587	
Lowden	544	30
Luverne	534	70
Manilla	773	15
Marathon	659	10
Marble Rock	573	½m.
Marcus	718	½m.
Maxwell	810	
Mechanicsville	708	100
Mediapolis	725	
Milo	585	
Milton	849	
Mitchellville	768	
Monona	674	
Monroe	917	
Montour	502	
Montrose	748	
Moravia	632	
Morning Sun	948	
Moville	507	
Murray	949	
Neola	921	
New Albin	543	
Newell	762	
New Hartford	570	
New Market	600	
North English	683	
North McGregor	616	
Norway	533	
Oakland	913	
Ocheyedan	599	
Ogden	933	
Olin	692	
Ossian	670	
Oxford Jct.	780	
Oxford	664	
Pacific Jct.	732	
Panora	958	
Paulina	617	
Peterson	521	
Pleasantville	738	
Pocahontas	625	
Pomeroy	910	
Porterville	984	
Prairie City	808	
Preston	593	
Pringham	814	
Radcliffe	645	
		6,090
Redfield	509	
Remsan	835	
Riceville	804	
Richland	534	
Riverside	698	
Riverton	687	
Rockwell	830	
Rowland	577	
Rolfe	994	
Russell	656	
Ruthven	787	
Sabula	918	
St. Ansgar	698	
Salem	578	
Scranton	683	
Sheffield	688	
Shelby	692	
		210
Shell Rock	839	
Schaller	661	
Shellsburg	511	
Sioux Center	810	
Sloan	643	
Springville	599	
Sutherland	722	
Tabor	934	
Tripoli	655	
Union	589	
Vail	578	
Victor	612	
Welker	505	
Wall Lake	659	
Walnut	878	
Waucoma	540	
Wellman	654	
Wesley	730	
West Bend	538	
West Branch	647	
West Decorah	531	
West Point	654	
		400
Whiting	57	
Whittemore	522	
Williams	5 0	
Winfield	820	
Winthrop	618	
Woodward	550	
Wyoming	794	
	64,362	
		1,150
		487
		240
		400
		23

To the people of West Union, Iowa.

For years the Bell charged about fifty people in West Union about $36 a year apiece, for telephone service, over iron wire grounded circuits, with local battery. The service was insolent and poor. So it was all over the State. The independents then commenced a fight for the communities, and built in like manner.

J. B. Hoge, page 190—March 1904 Telephony.

"Country life has been revolutionized during the past few years. The Bell patents had scarcely expired when the farmer was installing telephones and connecting with his nearest neighbors over a crude telephone—usually over a grounded fence wire—but in a short time they were connected up in little exchanges. This kept on growing until the company had the county seat and every post office in the county connected, and then they began to talk from one county to another. The rural exchanges in a majority of cases are owned by the farmers."

The Bell would not give the farmer any service at all. The people had to help themselves, and the farmer and his town friends were and are at the head of the movement.

Ed Hurmence and Fred Pleggenkuhle, two Fayette County farmers have built about 19 exchanges and toll stations in the counties of Fayette, Bremer and Chickasaw. They have about 200 telephones in West Union. Rates 15-12. That is what they have done for West Union. At Nevada, Iowa, Mr. Alderman and associates put in a plant in 1899, and in 30 days drove the Bell out of the place. Last winter the Bell tried to get back in the place, but not a telephone could it place there.

Why should a single Bell telephone be harbored in West Union?

Last fall C. H. Talmadge, F. Y. Whitmore, T. L. Green and H. P. Hancock, met James S. Clarkson, F. C. Blanchard, W. W. Blanchard and myself in Chicago. They were satisfied that the telephone business could be revolutionized. In January Mr. Whitmore and I met Mr. Hurmence and Mr. Pleggenkuhle, in West Union. We knew that they, in order to compete with the Bell, must build metallic circuits and scrap considerable plant and rebuild.

We came to an understanding. We shall do as we have stated. See map.

We have incorporated our company for the automatic and underground lines proposition, and will build it when we choose.

We have the dynamo ready for West Union, and if the telephone business were all—it would be shipped tomorrow, and we would, at once, serve the Sumner, Waterloo, Marshaltown, Des Moines and other independent telephone companies as declared.

We must be careful. Much is at stake. Vicious people like the editor of Sound Waves, are disclosing where the enemy of the farmer is—and as they have nothing to lose—are being used to fight the right.

Important as is the telephone business to you and to our farmer friends—it is not as important as is the business of lighting, heating and power.

This business of applied magnetism covers everything.

There were new and startling things at Chicago in 1893. There are no new things at St. Louis, except the X-ray—Wireless Telegraphy—Automatic Telephone Switchboards and the Automobile. Even they are not new.—So swiftly does the world accept the miracle of to-day and make it an ordinary fact of the to-morrow.

But there is a new, strange and uplifting sensation for every one at the Louisiana Purchase Exposition. There is a vast, overwhelming and almost endless display, from every state and every country, of the application of the known methods for lighting and power.

We knew that Iowa was a great state—but at the fair we can know the greatness of every state, and so have a deeper love for our country.

We knew that Germany, France, England and Russia were great foreign countries—but when we sense the meaning of the Japanese exhibit we know that the ends of the earth are coming together, and our patriotism expands to a love for humanity.

The power of human beings is upon us, we see not alone trade and commerce, and we feel that the earth is really being made free and whole from cruelty, greed and war.

MAN IS LEARNING TO CONTROL THE ELEMENTS AND TO REMAKE HIS CONDITIONS:

My first wish is that every Fayette County farmer may see this Fair—that he could fill his mind with the certainty of the good in man—that he could grow weary with looking at the evidences of the power of man—and then at evening, that he could stand upon the hill and see the marvel of every man saying "let there be light," could see, out of the darkness, the glimmer from millions of lamps slowly growing into full radiance—shining upon the spires, domes, roofs and walls of the glorious buildings, and upon the streets of the cities of the earth—could feel the miracle of it all and so know the touch that makes all men kin.

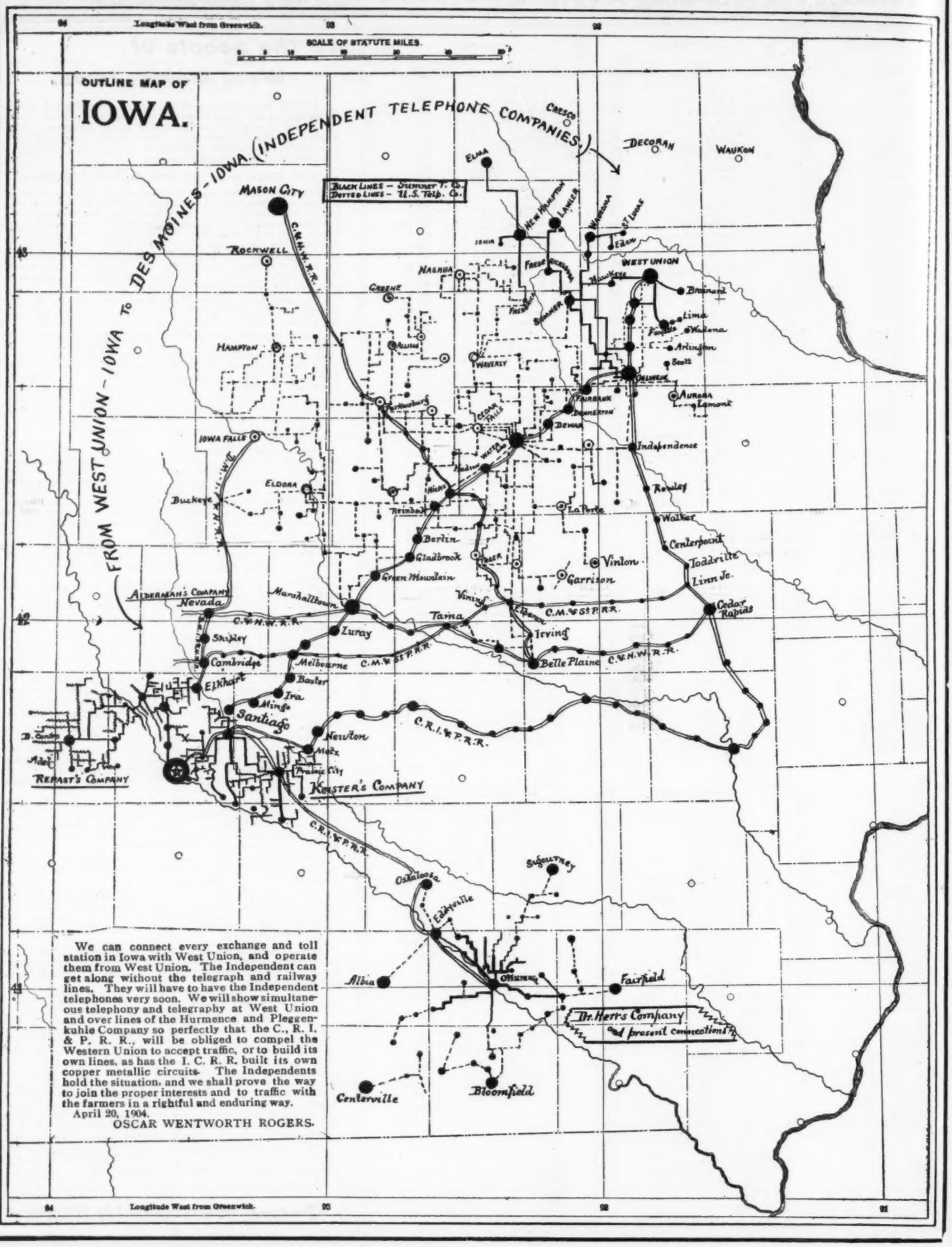
My second wish is that every one might see this fair.

All I ask of you is that you shall believe in yourselves as I believe in you, and that you will let me prove that a prophet may have honor in his own country.

St. Louis, July 20, 1904.

Oscar Wentworth Rogers

TO THE PEOPLE OF IOWA: Showing how the present Independent companies can join and have long distance business through every part of the state (see text). The farmer can be served. Showing how, under Sec. 2161 of the code, the Telegraph Companies can be made to do right.



To the People of Fayette County, Iowa:

The Bell creatures—some manual and telephone manufacturers—and some who just think they are independents, object to the declaration that the farmer is the factor in the telephone business of Iowa.

In a few places the town people are quarreling with the farmers.

In a few places the town people are taking favors from the Bell.

In a few places some farmers are connecting with the Bell.

Some day soon the Bell will not have a refuge in Iowa.

The farmer is 54% of the population of Iowa.

Des Moines is the only town having over 50,000
Only 5 towns have over 25,000 and under 50,000
Only 9 towns have over 10,000 and under 25,000
Only 11 towns have over 5,000 and under 10,000
While 64 towns have over 2,000 and under 5,000
And 99 towns have over 1,000 and under 2,000
And 201 towns have over 500 and under 1,000

GROWTH IN POPULATION IN IOWA.

Place	1840	1850	1860	1870	1880	1890	1900
State	43,112	192,214	674,913	1,194,020	1,624,615	1,911,896	2,231,896
Fayette Co.		825	12,073	16,973	22,258	23,141	29,845

In Fayette County there are of native born 25,893
Of foreign born 3,952
Native born of native parents 16,294
Native born of foreign parents 9,510

These Iowa people have built an empire within fifty years.

No kings, no presidents, no congressmen, no office holders have made Iowa. The people alone have kept close to the soil—and the cry of the earth have they heeded.

At first they were farmers, all—In the gardens of the towns to-day, crops are grown worth millions of dollars.

Eighty per cent of the people work each day, a longer or shorter time, in the soil.

Remember that all have given the best of body, heart and mind to the community. Remember this and then these figures will voice a song to your soul.

Under the rule of Kings, hushed were the singers of Babylon. Under the rule of the people of Iowa—their sons and daughters sow and reap their own. On the hilltop are the voices of gladness, and in the valley is the peace and love of home.

See what the Iowa farmer is doing.

Our farmer now fed his corn and hay to his stock on the farm, and became prosperous. So he was envied by the "meat combination," (adorable mistress of the gaudy railroads), and now the farmer must fight the railroads to the death, or manufacture his crops into products. **(The thing to do is for the farmers to combine within the limits of congressional districts and build and operate elevators—packing houses—and plants for manufacturing the corn products, such as starch, glucose and sugar.)**

In spite of combinations—trusts and monopolies our farmer has paid off the farm mortgage, built new and fine farm houses, sent his children to some college, and, it may be, has moved into town.

Take an example. The president of the Bank of West Union, (whose cashier, F. Y. Whitemore, is one of our new telephone company incorporators), was a farmer boy. His father was as good a man and citizen as we have ever had. The mother was lovely and patient—a worker and the best butter maker in all the country round about. John Jamison came to town—started a bank. Does any one think that he will deny that the farmer can dictate the telephone business around and in West Union?

Nearly every business in West Union has a farmer or a farmers son in it.

Joseph Hobson was a farmer. His son is now our District Judge.

H. B. Hoyt was a farmer. He and his sons are merchants now.

D. W. Clements was a farmer. He is one of our best lawyers.

Wm. Kent—Samuel Holton—John Brewer—David Bell—George Descent and many of our towns people were farmers.

Will these men deny the power of the farmer?

The Bell Company is an alien, insolent, tricky and contemptible organization.

Two farmers, Ed Hurmence and Fred Pleggenkuhle have a 200 point telephone plant in West Union. They are building new farmer lines. They have liquidated the dead stock of their company. Why should a single Bell phone be in West Union. At Nevada, Mr. Alderman and the business men cleaned out the Bell in 30 days.

1902 SOIL PRODUCTS—AND THEIR VALUES—PRODUCED BY THE FARMERS OF IOWA

CORN		WHEAT		OATS		POTATOES		HAY		PASTURAGE	TOTAL PRODUCED FROM THE SOIL (including other soil crops)
Bushels	Value	Bushels	Value	Bushels	Value	Bushels	Value	Tons	Value	Acres	
296,950,230	$83,432,700	13,512,840	$7,062,640	92,907,900	$22,297,900	12,051,670	$4,095,650	5,641,900	$36,787,320	8,336,795	$215,722,330

(1902) NUMBERS OF LIVE STOCK AND VALUES

Dairy Cows	Other Neat Cattle	Horses	Mules	Sheep	Swine	Poultry	Values
1,423,648	3,943,983	1,392,573	57,579	657,868	9,723,791	20,043,343	$278,830,096

IOWA CREAMERIES (AND MARKETS)

Place	No. Repo't-ing	Pounds made	Pounds sold to Patrons	Pounds sold in Iowa	Pounds sold out of Iowa	Value sold out of Iowa
State, 1902	601	59,642,487	3,924,489	3,945,378	51,772,020	$12,000,000
Fayette Co.	20	2,625,556	263,501	153,541	2,208,514	
State, 1903	661				91,761,661	$22,000,000
Fayette Co.	19				2,494,653	

(1903) IOWA LANDS AND TOWN LOTS (AND ACTUAL AND TAXABLE VALUES)

Place	Land		Town Lots	Taxable Value of Real Estate	Taxable Value Railroads, Sleeping Cars	Taxable Value Telegragh, Telephone	Taxable Value Express Companies	Total Taxable Values	Taxable Value Personal Property
	Acres	Value	Value						
State	34,620,303	$1,457,548,730	$429,952,632	$466,597,610	$56,947,711	$1,927,783	$420,483	$637,037,386	$112,043,999
Fayette Co.	450,775	17,254,018	3,291,430	5,093,669	544,237	23,225	5,601	6,876,446	1,209,711

(1900) MANUFACTURES

Place	No.	Capital	Cost of Material	Value of Products
State	14,819	$102,733,103	$101,170,357	$164,617,877
Fayette Co.	220	1,022,954	1,065,235	1,729,214

PARTIAL SUMMARY

Produced from the soil $215,722,330
Live Stock Values 278,830,096
Manufactures 164,617,877
Butter Shipped out of State 22,000,000
Part of the Iowa farmer's production $681,170,303

It is a silly thing for telephone manufacturers, constructors and owners to attempt to ignore the farmer in Iowa.

How about the town people? Who are they but farmers?

Take West Union for example. There has never been a moment from 1850, (when my father built the first roof), until now—in which the producer from the soil has not been the only factor in continuing the prosperous condition of any merchant, business man or laborer of the place.

Nearly every family has its garden. Everyone is a farmer. At first our active farmer worked all the while, ceaselessly plowing, dragging, sewing, reaping, shocking, threshing, binning, farming and marketing his wheat. This was the great crop from 1850 to 1868. Then it failed.

The farmer sold his wheat to Wm. Larrabee at Clermont, on the Turkey River—or at Fayette, on the Volga River—or in greater amounts at McGregor on the Mississippi River, (for shipments to the "reverenced East").

There were mills at Auburn, Eldorado, Dover, Elgin and other places—but they have mostly failed, for one reason or another, and all are but the ghosts of other days. The wheat was gone!

The Minnesota mills at great water powers, bought further and further a field until the "combination" stifled competition in the wheat and flour line.

Our little mills, with their little water powers, then ground corn into meal for the local use; and now are mostly a negative property. **(The thing to do is to develop every water horse power and grind out electricity.)**

The issue by the farmer and his friends in the town, against the Bell Company must be made throughout the state. If the towns people do not help—the farmer will do the work alone.

At West Union the issue is made and we shall soon know whether there is one business man who will patronize the Bell against the locally owned and farmer backed company.

This telephone business is cheap and easy. The light, heat and power developments are the required things. Our Fayette County people have capacity and character. They are worthy of every good and profit which the restless spirit of the age is whirling toward them.

They have helped to make Iowa more than an empire. The farmer has been and *is* to-day the heart of the progress. He will combine with his neighbor and then the "captains of finance"—the corporation bandits—the railway wreckers—the unworthy rich and the hyenas of commerce will realize that people who can produce a billion dollars in one year, by labor alone, do not need any teaching.

All are farmers in Iowa.

St. Louis, July 20, 1904.

OSCAR WENTWORTH ROGERS.

Highest Efficiency

WITH

Handsome Appearance

ARE CHARACTERISTICS OF ALL

KELLOGG APPARATUS

KELLOGG SWITCHBOARDS

For the
Largest Exchanges

KELLOGG SWITCHBOARDS

For the
Small Exchanges

For Common Battery

For Magneto, or
For Both

Kellogg Switchboard & Supply Co.

Green and Congress Streets, Chicago

LOS ANGELES OFFICE
Seymour Building.

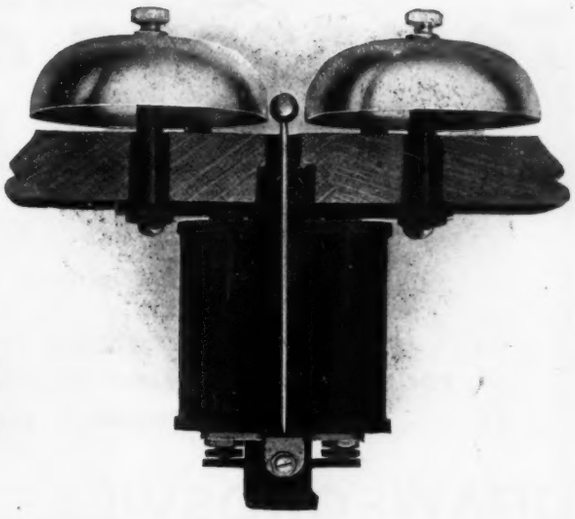
CLEVELAND OFFICE
Electric Building

PHILADELPHIA OFFICE
Keystone Telephone Bldg.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

KELLOGG TELEPHONES

Are made of the very best material.



KELLOGG TELEPHONES

Are made by the finest mechanics that can be had.

KELLOGG TELEPHONES

Are made under direct supervision of expert mechanical and electrical engineers.

Substantial in Construction and Made of the Best Material. There is No Cost to Figure for Maintenance.

Good Equipment Means Good Service and Growing Patronage.

Let Us Make You Quotations.

Kellogg Switchboard & Supply Co.

Green and Congress Streets, Chicago

LOS ANGELES OFFICE
Seymour Building

CLEVELAND OFFICE
Electric Building

PHILADELPHIA OFFICE
Keystone Telephone Bldg.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Crawfordsville Wire and Nail Co.

MANUFACTURERS OF

"MONARCH" BRAND HIGH GRADE

Telephone and Telegraph

--WIRE--

E. B. B.-B. B.-STEEL

Single and Double Galvanized Signal Strand

OUR WIRE STANDS THE MOST EXACTING TESTS.

IF YOUR SUPPLY HOUSE CANNOT FURNISH IT, WRITE US. WE CAN.

PROMPT SHIPMENTS ALWAYS.

CRAWFORDSVILLE WIRE & NAIL CO.

CRAWFORDSVILLE, INDIANA, AND 1501 MONADNOCK BLDG., CHICAGO.

"READY" MEMORANDUM PAD HOLDERS

PATENTED

The "Ready" Pad Holder is neat, ornamental and useful. When placed beside your phone, you always have paper for memorandums or orders. Each holder has straight edge, which holds writing pads and tears off memorandums.

No. 1 Style fastens to the wall beside phone.

No. 2 Style fastens to the telephone.

Either Style $1.00 each.
By mail, prepaid, $1.25 each.
Agents Wanted.

No. 1

WE MANUFACTURE

READY PAY OUT REELS and READY SPECIALTIES.

WE CARRY COMPLETE LINE OF TELEPHONE SUPPLIES

THE W. G. NAGEL ELECTRIC COMPANY, 520 ADAMS ST. TOLEDO, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

INDEPENDENT LOCAL AND TELEPHONE LONG DISTANCE SYSTEM

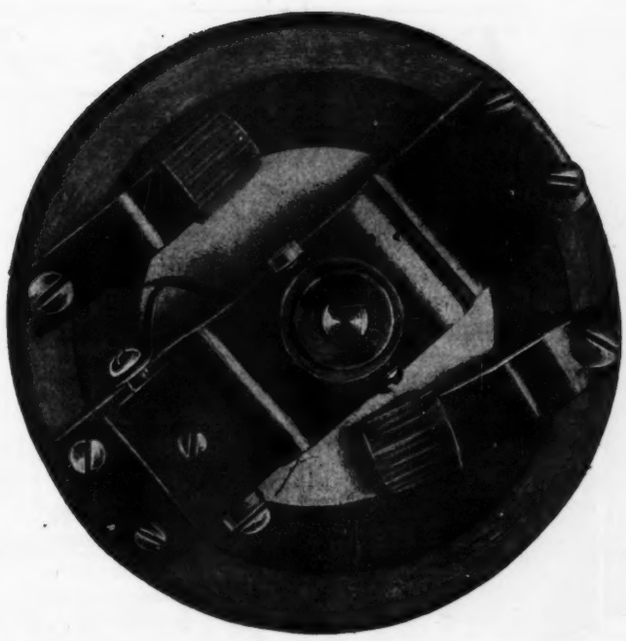
HAVE YOU THE FRYING and SIZZLING KIND

TELEPHONES

If you have them you have not the best. A transmitter that will fry and sizzle under 4-6 to 8 Batteries is not a long distance kind. Test your transmitter with excessive Battery power. That is proof. We've got the kind that stand the Battery, hence always do the work.

SWITCHBOARDS

EUREKA ELECTRIC CO.



Gen'l Offices and Factory:
GENOA, ILL.

Sales Dept.:
MONADNOCK BLOCK, :: CHICAGO

INDEPENDENT LOCAL AND TELEPHONE LONG DISTANCE SYSTEM

To the

Telephone Manager

¶ There is a big trade to be had in selling well-to-do farmers and planters Acetylene Lighting Plants.

¶ Some may be close-fisted or stingy but there is hardly one but would buy a plant from you if you showed him or told him about it.

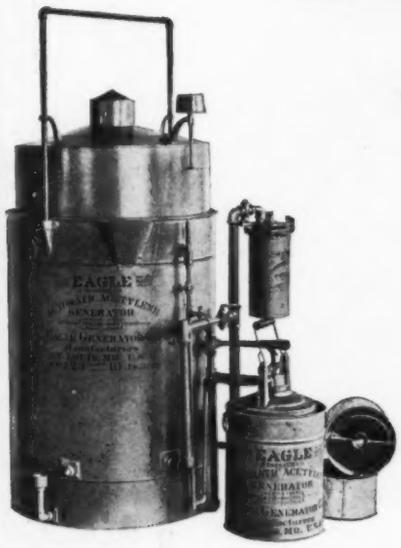
¶ We furnish you the advertising that explains it clearly.

¶ Try it.

¶ Other good people make good money at it, so can you.

WRITE US.

That's the Name

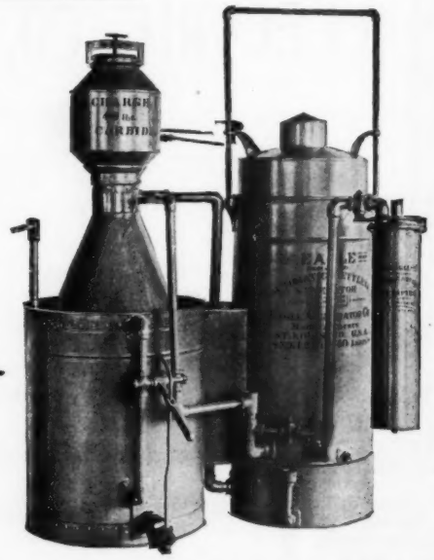


WATER-FEED "EAGLE" GENERATOR

For use anywhere. Requires no water-works or sewerage facilities.

CARBIDE FEED "EAGLE" GENERATOR

For use in places having water-works and sewerage facilities ∴



EAGLE GENERATOR COMPANY

Pine and 16th Streets **ST. LOUIS, MO.**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

INSURE YOUR CABLES

Against Lightning or Heavy Currents

Type SS.—Cook Pole Cable Terminal, with line fuse and carbon plate arresters and metal cover. Pat. May 20, 1890; Oct. 21, 1902; other patents pending. All sizes, 5 pairs up.

Cook's New Pole Cable Terminal
---TYPE S. S. or TYPE T. T.---
Furnishes Perfect Protection.

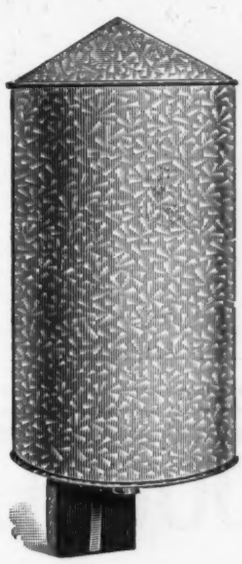
It's **way ahead** of the old style pole house.

It is **absolutely weather-proof**—the **galvanized iron sliding cover** insures that.

It is convenient and easy to get at.

When the cover is raised it stays up—locked there automatically. When it is closed it locks down automatically.

One company using **200** says they are **ideal**. A hundred other users echo this opinion. So will you when you are using them.



Order **Type S. S.** if you want the terminals with iron cable box.

Order **Type T. T.** if you want to use them with pot-heads.

Any Number of Pairs.

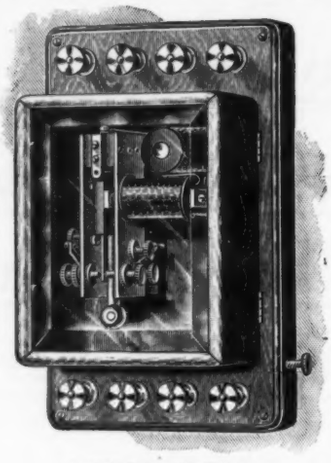
FRANK B. COOK, Manufacturer

242 W. LAKE ST., CHICAGO

THE ILLINOIS POLE CHANGER

The Latest Development in Ringing Generators.

Is Adapted to Use Where Either or Both Alternating and Pulsating Currents are Required.



NUMBER 1 STYLE

Absolutely Guaranteed to Meet All Ringing Requirements. Will ship on Thirty Days' Trial.

SIZE ONLY 9X6X5 INCHES. **WEIGHS BUT FIVE POUNDS.**

Made up in Four Different Styles.

Write for Descriptive Circular and Prices.

ILLINOIS ELECTRIC SPECIALTY COMPANY

171-173 South Canal Street, ***CHICAGO, ILL.***

It in need of TELEPHONES "connect up" and let us talk it over together. While we are only one of many, the "Williams" is *the one* you should investigate.

WE OPERATE A FACTORY
NOT A REPAIR SHOP

The Williams Telephone & Supply Co., 73-79 Central Ave., Cleveland, O.

DOUBLEDAY-HILL ELECTRIC CO.

MANUFACTURERS AND DEALERS

ELECTRICAL SUPPLIES

PITTSBURG, PA.

Complete Line of Telephone Construction Material.

QUICKEST DELIVERY, HIGHEST GRADE, LOWEST PRICES.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Important Notice

The Chicago Telephone Supply Co., of Elkhart, Indiana have recognized the validity of our Self-Restoring Drop patent and have settled with us in full for all infringing drops made by them in the past. They have also made a contract to pay us royalties upon all self-restoring drops made by them in the future.

We have therefore given them a receipt in full for all damages on account of past infringements and have issued to them a license to make self-restoring drops under our patent.

Other companies are negotiating for settlements, and suits will be filed by us against all manufacturers making infringing drops, if immediate settlement is not made outside of court.

The settlement made by us with the Chicago Telephone Supply Co. covered both the direct and indirect self-restoring drops made by that company. Damages were collected by us upon both forms and future royalties will be paid by them upon *all* the mechanically self-restoring drops, *of any kind*, which the company makes.

This is a recognition of the breadth of our patent by a conservative and well known company which, after a thorough investigation, decided that it *must* protect its customers by a license from us.

Certain of our competitors are still trying to minimize and limit our patent. But all purchasers of switchboard drop are warned not to buy any form of mechanically self-restoring drops where the drop is restored directly or indirectly by the plug when entering the jack, excepting from us or our licensees.

Western Telephone Manufacturing Co.

The Pioneer Independent Telephone Factory **CHICAGO, ILLINOIS**

... PAY-STATIONS PAY ... PAY-STATIONS PAY ... PAY-STATIONS PAY ... PAY-STATIONS PAY ...

BAIRD BAIRD

EASY MONEY

and plenty of it can be made
from your toll service by placing

BAIRD PAY-STATIONS

liberally over your territory.
Look around for the Soft Spots

THEY ARE

GOLD MINES

Write us to-day for "Practical Pointers"
BAIRD MANUFACTURING CO.
3 Michigan St. CHICAGO

BAIRD BAIRD

... PAY-STATIONS PAY ... PAY-STATIONS PAY ... PAY STATIONS-PAY ... PAY-STATIONS-PAY ...

... TIME STAMPS TIME TOLL SERVICE ....

... TIME STAMPS TIME TOLL SERVICE ....

Look for the Tags

They are your protection against inferior quality

Our

Telephone and Telegraph Wires

are

Extra Double Galvanized

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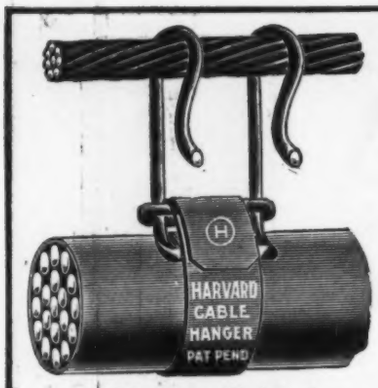

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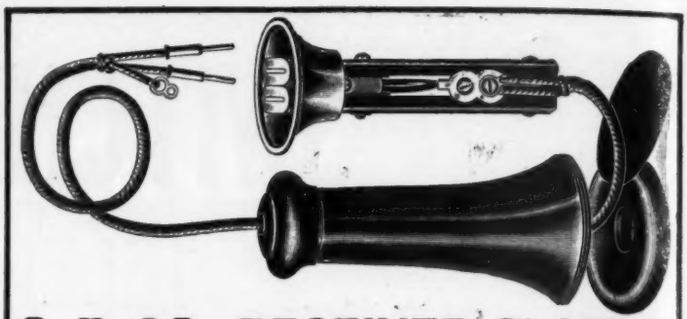

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AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. VIII. CHICAGO, AUGUST, 1904. No. 2.

Concerning Telephone Lines

SAMUEL G. McMEEN.

THE branch of telephone work which has to do with testing of lines appeals to certain natures as one of the most interesting in all the work; this is natural, because of the elements of accuracy which are required, and because in some phases of testing things can be done and discovered which cannot be arrived at by other than the careful means involved. The work is instructive, because it involves the continued application of fundamental electrical principles, and in time these principles become so thoroughly well known to the user as to be very valuable to him in other parts of his practice. To the business itself the matter of testing and fault location is very useful, because in several of its applications it is possible for it to save considerable sums of money.

The portion of this series which will treat of testing and fault location is intended to cover the important phases of the work and to point out the reasons for doing the things as described. It will not attempt to cover all of the variations of method which have been found possible. There are three different kinds of testing, each having different objects, and they are these:

1. To identify the conductors of a cable.
2. To know whether the cable or the line is in good condition and whether it should be accepted for use.
3. To know the nature of a fault—or "trouble"—and where it is.

Identifying the conductors of a cable is the kind of testing most often necessary in construction and installation, and is easy. The methods are so simple that to cite a few useful features will probably serve every purpose. In testing out an aerial or underground cable for the identity of its conductors, connect the wires to the office terminal first. In doing this it is well to identify the various groups of pairs and connect them in a recorded order. These groups are the fixed parts into which the whole number of pairs is divided, and their existence greatly simplifies the work of testing out. A telephone receiver, a buzzer, a vibrating bell, or a polarized ringer, can be used to identify the wire upon which the testing current is placed; the latter naturally should be a battery or generator current, depending on which of the detecting devices is chosen.

Note.—This is the fourth of a series of articles by Mr. McMeen on telephone lines. The succeeding articles will treat further of testing and of the means of locating faults, the electrolysis of underground cables, and other important matters.

As pair by pair of the cable is identified, it should be placed in position on the terminal to which it is to be fixed, and when a given group or the whole cable has been tested out, the whole test should be repeated rapidly to discover any error which may have crept in.

In order to make the identification of pairs rapid and easy, switchboard cables are laid up of pairs in which one wire of each differs in color or marking from all the rest.

When an aerial or underground cable is placed in position and terminated, the tests for identifying the conductors will have shown whether any of the wires are open and whether any of them are crossed with each other. The fact that they are open or grounded on the sheath will be shown by a failure to get the testing potential from the distant end. The fact that they are crossed together will be shown in the first or final test for identification by the fact that current is received over more than one wire when it is sent from the distant end on only one. For this reason the final test should be made running over the whole group in checking the identification of each conductor.

When this part of the work has been completed it is necessary to know whether the conductors are in good condition and whether they comply with the guarantee of the manufacturer. This guarantee or the requirement of the specifications under which the cable was made provides that it shall have an insulation resistance not below a certain number of megohms per mile and an electrostatic capacity not above a certain fraction of a microfarad per mile. The insulation resistance per mile is simply the resistance of the insulating material, and with reference to testing and the quality of lines is often referred to as "insulation." Because it is simpler, insulation resistance is usually expressed in megohms. A megohm is a convenient term for a million ohms. The insulation resistance ordinarily required by specifications and usually guaranteed by manufacturers, is 500 megohms per mile or more, and it is not difficult to make and install cables which will have much more than this degree of insulation resistance.

The method of finding out the amount of insulation resistance which a cable has, is in principle quite a little simpler than to learn the resistance of a wire. The principle is simply that of allowing current to flow through a galvanometer into the wire under test, from which it will then flow through the insulation resistance to the earth or to the cable sheath. In all the drawings of testing methods in this series a ground is shown. It is to be understood that the sheath of the cable may be considered to be that ground in case it is the testing of cable conductors which is considered in reference to the drawing.

Because the insulation resistance of cable conductors in reasonably short lengths is very high, and because the potentials to be used in testing must be kept within reasonable limits for conditions of safety, the galvanometer for insulation resistance tests must be of high sensitiveness, or sensibility. The first successful form of high sensibility galvanometer was that designed by Sir William Thomson, now Lord Kelvin, and was used for receiving signals over the early Atlantic cables. The general plan of his galvanometer was that of suspending a compass needle inside of a coiled wire, but he changed the form of earlier galvanometers having a compass needle and a coil, by making the needle very light, suspending it by a single fibre of

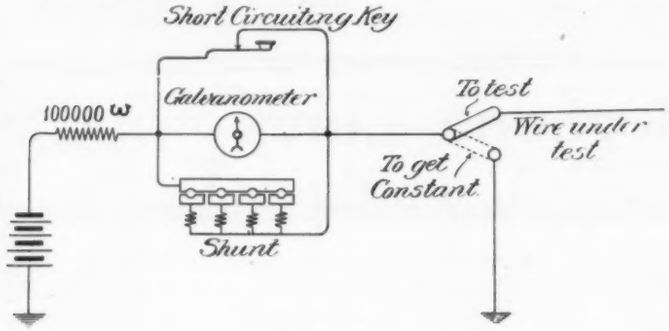


FIG. 1.

unspun silk, attaching a very light silvered glass mirror to the needle and surrounding it with a large coil of very fine wire. This arrangement left the needle very free to move, so that very feeble currents in the wire would move the needle and the mirror in some degree. In addition to these advantages the mirror reflected a beam of light upon a scale, so multiplying the mirror's movement. As a beam of light used as a pointer is always straight, as it can be of considerable length, as it has no weight, and as the angle of the mirror's movement is always doubled, the appearance of this Thomson reflecting galvanometer was a remarkable step forward. It enabled things to be done which could not be done before, and this is the measure of the value of invention.

For two reasons, however, the Thomson galvanometer is a particularly annoying device. The silk fibre suspension of the mirror system is so delicate that it is usually found to be broken at the critical moment of use. In these days of varying magnetic fields, due to power systems, the Thomson instrument is very erratic in its performance unless screened by heavy magnetic shields, and these detract from its portability and from its convenience. D'Arsonval reverses the arrangements of elements used in the Thomson instrument, using a movable coil and a fixed magnet. The latter is powerful and the former is light. The coil is suspended in different ways, but always by means of wires or other conducting things, so that current may be carried to the coil even though it is movable. A mirror carried by the coil enables the advantage of a beam of light to be retained, and also enables another and somewhat more convenient and accurate method of observing to be used, retaining the advantages of the beam of light upon a scale. This method is to use a telescope, which is pointed at the mirror, showing in it the *reflection* of a scale, usually attached to the telescope stand. The telescope has magnifying power and is of the kind which reverses the image, so that the scale is marked with reversed figures and is placed in an inverted position on the stand. What the observer sees therefore is some portion of the scale, erect and non-reversed. The sensibility of this type of galvanometer is not so great as is possible with the Thomson form, but its many advantages make it the best existing form.

For all purposes of measuring insulation resistance, the galvanometer must have a means of reducing the current passing through it and this is accomplished in the use of a shunt. Commercial galvanometer shunts are small resistance boxes containing coils of resistances proportioned to that of the galvanometer. A common form has four coils in one box, with arrangements for selecting either of the four. The resistance of the coils are respectively 1/9, 1/99, 1/999 and 1/9,999 of the galvanometer resistance. A little thought will show that when the galvanometer is shunted at one or the other of these coils, either 1/10, 1/100, 1/1,000 or 1/10,000 of the current will pass through the galvanometer coil, and the remainder through the shunt. The natural reason for selecting such odd fractions for shunt resistance is to reduce the galvanometer's fraction of the current to the convenient form of 1/10 or some multiple of that amount. The only other essential things for insulation resistance tests are a key which normally short-circuits the galvanometer, some kind of a switch, a battery or other source of potential, and a standard high resistance. In Fig. 1 the arrangement of these parts is shown and the method of using such an arrangement is this:

First find the deflection which the galvanometer will give through the standard high resistance of known amount, then the deflection with the same battery through the insulation resistance to be measured. If the standard high resistance were of many megohms this comparison would be simple. A standard resistance of many megohms, however, would be expensive and bulky, so that it is customary to have the standard resistance 10,000 ohms, which is 1/10 megohm, and to take a preliminary test reading through that resistance with the assistance of the galvanometer shunts. Making such a test reading to determine conditions for testing the unknown insulation resistance, is called "getting a constant." The operations and reasons are as follows:

Place the switch in Figure 1 in the position to get the constant; use the largest shunt; press the short-circuit key and observe the deflection; if it is very small, release the short-circuit key and choose the next lower shunt; again press the short-circuit key and observe the deflection; if the deflection is on the scale, and is fairly large, note it as soon as it is well settled; if not, take a lower shunt and when a satisfactorily large reading is secured multiply it by the multiplying value of the shunt and by the resistance in megohms of the standard. For example, suppose the following conditions to exist:

Shunt, 1/999; this will let only 1/1,000 of the current

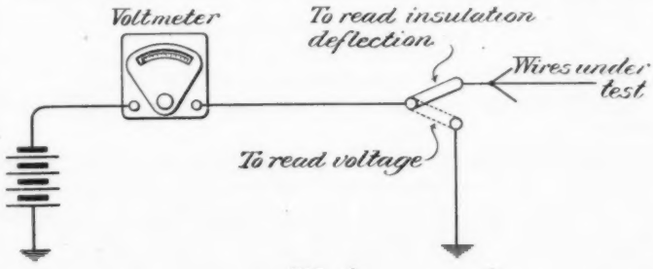


FIG. 2.

go through the galvanometer and the multiplying value of this shunt is 1,000.

Standard resistance, 100,000 ohms (1/10 megohm).

Deflection, 85 scale divisions.

The constant is therefore $85 \times 1{,}000 \times 1/10 = 8{,}500$. That is, the insulation resistance through which the same battery would give one scale division deflection, is 8,500 megohms. The result of this preliminary operation, which really is simple, is to give a constant number which may be used through a long series of tests and which only needs to be resecured at intervals to make sure the conditions have not changed.

The constant secured, throw the switch shown in Figure

r to the position required for testing, select a shunt, depress the short-circuit key, note the deflection, and if necessary repeat the process, selecting lower and lower shunts, or perhaps until no shunt at all is necessary. In most cases the first trial with a shunt will tell whether any is necessary, and the largest reading will of course be given with no shunt. Suppose that with no shunt at all a reading of five divisions is secured. The insulation resistance of the wire under test will then be found at once by dividing the constant, 8,500, by the observed deflection, 5, giving 1,700 megohms as the actual insulation resistance of the wire under test. Similarly if the deflection with no shunt had been found to be 10 scale divisions, the insulation resistance of the wire would have been 850 megohms. If the wire had been in such condition as to give 15 scale divisions with the 1/9 shunt on the galvanometer, the multiplying power of that shunt tells us that 150 scale divisions would have been given with no shunt. Therefore, the insulation resistance in such a case would be 8,500 divided by 150, which equals 70 megohms, for the insulation resistance of that conductor.

In all of these cases the observer was getting the insulation resistance of the wire irrespective of its length, and it is necessary to know the result in megohms per mile. as the guarantee and the specifications were written in such terms. When it is remembered that the reason the insulation resistance is not immeasurably high is that current is leaking from the conductor through its insulating material, it will be seen easily that with other conditions equal, the longer the wire the lower its insulation resistance; so that the insulation resistance of one mile of such wire will be less than that of two miles or more than that of less than one mile. To determine the insulation resistance per mile, therefore, of any conductor, learn its actual insulation resistance as described, and multiply this result by the length of the conductor in miles. For example, in the case first cited, having an actual insulation resistance of 1,700 megohms, suppose the length to be 3/8 mile. Multiply 1,700 megohms by 3/8 and the result, 637.5 megohms, is the insulation resistance of that conductor per mile.

In case short lengths of cable, found by preliminary tests to have high insulation resistance, are to be tested merely to discover whether the manufacture and erection can be passed, a number of wires can be tested at once, thus shortening the operation greatly. Taking the case of the cable which had a conductor testing 1,700 megohms actual insulation resistance, if 50 pairs (or 100 conductors) had been tested at once, the result would have been 17 megohms instead of 1,700 megohms, assuming the character of all the wires to be the same. With this convenience of testing, the method reduces the time so largely as to make it very valuable.

In all measurement of cables for insulation resistance it is customary to test each wire against all the rest grounded with the sheath. If the wires are tested in groups all except the group under test should be connected with the sheath and to ground. Experience shows that extreme care is not essential in this particular, as the presence of a few grounded wires within the cable, if the sheath is grounded, gives results no different than those with all the wires grounded except the wire or the group under test. In measurement for electrostatic capacity much greater differences exist in this particular, and uniform conditions should be set up and adhered to.

Simple as are these ways of getting at the insulation resistance of wires, even simpler methods are valuable, because the galvanometer equipment is not always at hand and so great accuracy is not always necessary; an alternative way is to use a voltmeter, and Figure 2 shows the conditions which are essential. With a battery or other source of energy somewhere within the range of the voltmeter, first place the switch in the position shown by the dotted lines and read the voltage of the source of current. Make a note of this and throw the switch to the other position. From the first reading and the reading taken in the latter case, the resistance of the voltmeter being known, the insulation of the wires under test can be determined.

The rule is this: Subtract the deflection given on the tested wire from the deflection given to ground; divide the remainder by the deflection on the tested wire; multiply this result by the resistance of the voltmeter. The product given is then the insulation of the tested wire in ohms; it will be in megohms if a decimal point is placed between the sixth and seventh figures counting from the right.

For example: Suppose that a voltmeter having a resistance of 25,000 ohms were used; the resistance of the instruments is always furnished by the manufacturer; that the first deflection with the switch to ground was 100 volts; this is the full voltage of the battery; that the deflection upon the tested wire was half a volt; then the insulation resistance of the tested wire is 100—.5, divided by .5, multiplied by 25,000. The result is 4,975,000 ohms, or 4.975 megohms. The measurement of insulation resistance by the voltmeter method is much more readily done if the wires are tested in groups, and the method is particularly valuable for testing out lengths of second hand cable.

The second thing required to be known in testing cables for general condition is the electrostatic capacity of each wire. The specifications usually call for an average, in this

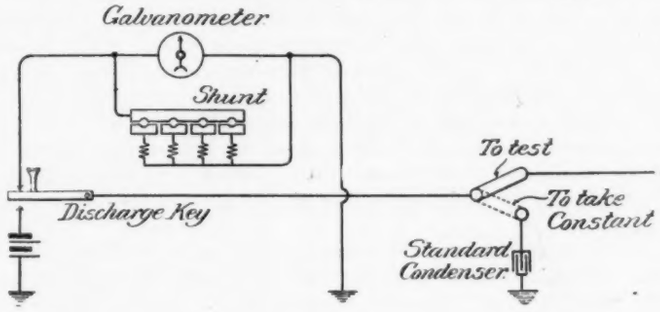


FIG. 3.

respect, of about .080 microfarad per mile. As in the case of insulation resistance this term also is subject to contraction for convenience, and the electrostatic capacity of conductors is usually spoken of simply as "capacity." While it is of advantage to have the insulation resistance as high as possible, it is of advantage to have the capacity as low as possible. It is easily seen that this must be so, when it is remembered that a statement of the capacity of a wire for its mate is merely a statement of how large a condenser the two wires form. As two wires with the insulating material between them do form a condenser, although one of small capacity, the effect is to short-circuit the line to that extent, quite as if the wires had not had such a quality, and the condenser, small, perhaps, but none the less a condenser, had been bridged across the pair. If the pairs were used not for talking but for telegraphy, or some other electrical use with continuous current, the capacity would have a less harmful effect, as alternating currents pass through condensers with much freedom, and the voice currents sent over the line will to some degree pass through the condenser formed by the wires and thus be lost from usefulness at the distant end.

In Figure 3 are shown the conditions for capacity tests, using the principal items shown in Figure 1 for insulation tests. The discharge key is one which has two contacts, one above and one below, and is usually arranged so that it may be locked in the lower position and released quickly when desired. The condenser is one of accurately known capacity and is usually either of 1/3 microfarad or is adjustable in small fractions up to about 1/2 microfarad. For tests such as we are now considering, the 1/3 microfarad

standard is as good as any and is cheaper than the adjustable form.

The procedure of capacity measurements is as follows: Place the switch in the position to take the constant; depress the discharge key, holding or leaving it down for a few seconds. This simply causes the battery to charge the condenser; release the discharge key and note the galvanometer deflection. If but two or three cells of dry battery were used, the deflection will be well on the scale with a low shunt, and it will be noticed that the galvanometer movement simply makes one steady swing, stopping and returning to zero immediately. The figure thus found is the deflection which 1/3 microfarad will give with no shunt and with the battery used. Throw the switch to the testing position; depress the discharge key for a few seconds and release as before, noting the deflection now given; then the capacity of the wire under test will be most easily found by multiplying 1/3 microfarad by the last deflection and dividing by the first.

For example: Suppose the deflections to get the constant were 50 scale divisions with the 1/9 shunt; as this shunt has a multiplying power of ten, the deflection is equal to 500 scale divisions with no shunt; suppose the test deflection was two divisions with no shunt; then 1/3 microfarad times 2, divided by 500, equals .00133 microfarad, which is the capacity of the wire under test.

Just as a condenser has greater capacity when its conducting surface is increased, so a pair of wires has greater capacity as its length is greater, if other things are equal. Insulation and separation being the same, large wires have greater capacity per length of pair than small ones; size, length and separation of the wires of a pair being the same, the capacity is lower or higher, depending on the kind of insulating material used; dry paper is the standard insulating material for telephone cables, because lower capacity is secured by its use than by the use of any other convenient material.

In the measurement of capacity even approximately correct results are only possible when the test is made upon one wire against its mate connected to all the rest and the sheath, and it is easy to make this test on one wire against its mate, all the rest, the sheath and ground connected together. The results given by such measurement will be in conformity with the conditions met in the use of the pair, and a measurement of one wire *against its mate only* will give results of startling inaccuracy.

Capacity tests of much refinement cannot be made by means of ordinary voltmeters, which is unfortunate in a degree, because by means of capacity tests the location of breaks in open wires can be made. Fortunately, however, a telephone receiver in connection with suitable accessories, forms a very convenient means of locating such breaks, and when they are in long cables or upon long toll lines, considerable saving frequently can be made. Such tests as these, together with the simplest and most convenient methods of locating crosses and grounds, will be treated in further issues of this series.

NORTHERN ILLINOIS TELEPHONE MEETING.

One of the numerous thriving Independent organizations of the middle west is the Northern Illinois Telephone Association, which is made up of Independent exchanges west and north of the Illinois river. Representatives of these exchanges meet quarterly to transact business and to take steps toward furthering the Independent propaganda in their territory. The last meeting of the association was held at Savanna, Illinois, where routine business was transacted. The principal subjects of discussion were the proposed extension of toll lines controlled by the association and the new rate schedule, but decisive action was deferred until the next meeting. Reports from all of the exchanges were highly satisfactory, a steady growth being reported in each instance.

A highly pleasing feature of the meeting was the entertainment provided the delegates by Frank Linnell, president of the Carroll County Telephone Company. This consisted of a seven-mile steamer ride up the Mississippi river to Mr. Linnell's beautiful summer home where the visitors were regaled with one of the fish dinners for which Mr. Linnell is famous. Among the delegates who partook of his hospitality were:

R. H. Gibboney, J. H. Camlin, James Corcoran, Rockford Home Telephone company; J. W. Thompson, Dr. C. Segerlund, Boone County Telephone company; A. B. Sheadle, W. P. Landon, H. Wales, Ogle County Telephone company; E. D. Cheadle, E. W. Murray, E. R. Conklin, Interstate Telephone company; F. A. Knott, Byron Telephone company; Frank Linnell, L. D. Bowden, Carroll County Telephone company; L. A. Herrick, Stephenson County Telephone company; F. M. Iocum, West Brooklyn Telephone company.

One of the leading workers in the association is Robert H. Gibboney, superintendent and manager of the Home Telephone Company of Rockford, Illinois, and who is also secretary of the association. For a number of years Mr. Gibboney was manager of the Bell exchange at Rockford and was looked upon by the Bell people as one of their most valuable men in the state. When the Independent movement took form at Rockford, Mr. Gibboney, foreseeing the success of the proposed new company, immediately allied himself with it. The Bell company made strenuous efforts to retain him in its employ, but the gospel of Independent telephony had done its work, Mr. Gibboney preferring to identify himself with a live, winning cause than to remain with a company that by reason of its unsatisfactory service was rapidly losing popularity and prestige. Like many another good telephone man he saw the handwriting on the wall and cast his lines with the Independents. That he acted the part of wisdom and displayed ripe judgment in this move is evidenced by the splendid success that has marked the efforts of the Home company in Rockford. And it is universally admitted in that city that a large measure of this success is due to the unremitting efforts of Superintendent Gibboney to give the people of the Forest City the very best service possible at a reasonable figure. Mr. Gibboney stands high in telephone and business circles, not only in his home town, but all over the state and no man in northern Illinois is oftener consulted on matters pertaining to telephony.

RADIOPHONE ON EXHIBITION.

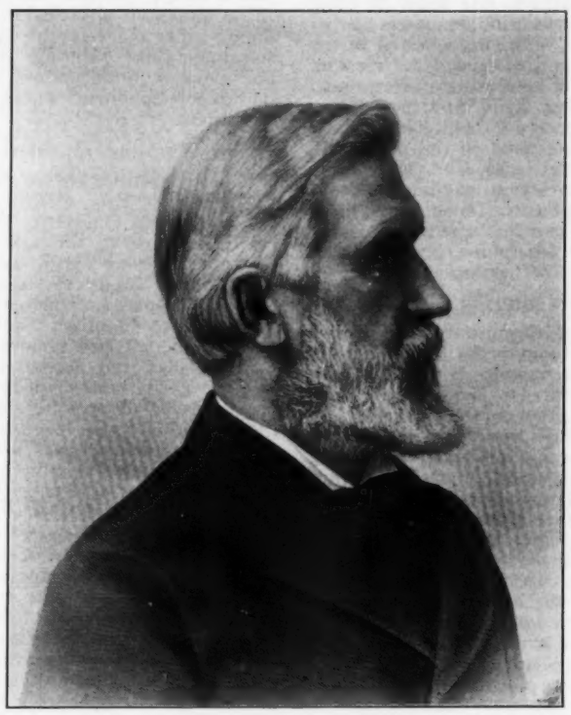
The exhibit of a radiophone transmitting and receiving station is proving one of the most attractive exhibits in the Palace of Electricity at the St. Louis fair. The radiophone is a combination of an arc light, reflectors, and what is known as a selenium cell. By its means speech is transmitted to distant points without the use of wires or other such intervening medium, the translation taking place over a beam of light furnished by the arc and projected in a slender beam by a parabolic reflector. By this means Ernst Ruhmer, the noted German physicist, has succeeded in transmitting speech a distance of fifteen miles.

A former army bugler, who served under General Joe Wheeler, sounds the various bugle calls in the transmitter booth, and these are received with remarkable volume and clearness in the receiver. The public is cordially invited to inspect this exhibit and listen to the bugling. As an example of the interest which this exhibit is attracting it may be stated that an average of 650 visitors per day, or about 4,000 per week, take advantage of this opportunity to hear sounds transmitted a distance of 500 feet over a ray of light.

Banquet to Dr. Elisha Gray in 1878

THAT the Scriptural axiom, "A man is not without honor save in his own country and among his own kin," does not always hold true, was evidenced in a most emphatic manner by the now famous complimentary banquet and reception given in honor of the late Professor Elisha Gray, Ph. D., by three hundred of his neighbors and friends at Highland Park, Illinois, on the night of November 15, 1878. This event, seemingly unimportant at the time, has since become closely woven with the history of the great telephone movement. As an incident of the early days of telephony, and as a tribute to a worthy man and a great inventor, it is of especial interest, possessing enough of genuine historical value to engage the attention of any and all who are engaged in spreading the gospel of telephony.

The plan to tender Professor Gray a banquet had its inception at an informal meeting of prominent Highland Park gentlemen, at the residence of Henry C. Carver, Esq., about three weeks previous to the time the event took place. It was unanimously voted at this meeting to invite Dr. Gray to meet his neighbors and friends in a social and festal gathering that he might receive their congratulations upon his success as the inventor of the telephone. Committees were appointed to the several duties required, and addressed themselves in earnest to the work before them. Funds were raised, place of meeting selected, invitations issued, toasts prepared, speakers secured, music provided, wires and instruments made ready, and the banquet finally spread, with that promptness and good taste which mark every earnest movement. Little could have been added, in plan or execution, to secure greater success.



DR. ELISHA GRAY.

The committee of arrangements, to whose untiring efforts the success of the function was mainly due, consisted of the following gentlemen: C. H. Summers, S. M. Millard, H. C. Carver, W. W. Boyington, Ford C. Hall, Edward P. Weston, W. S. Lasher, W. O. Hipwell, Schuyler M. Coe, William A. James, John Middleton, E. H. Denison, W. M. Goodridge, S. R. Bingham and E. B. Weston.

To embody and preserve the spirit of the occasion as a permanent testimonial to Dr. Gray, the committee determined to condense the various reports published by the leading journals and present them in a form convenient for future use. It is from these published accounts that TELEPHONY gets its material for this article..

The Chicago *Times, Tribune* and *Inter Ocean,* as well as the *Interior* and *Advance,* gave careful and appreciative reports of the proceedings. The *Tribune* opens its report with these preliminary paragraphs:

Ever since the day when Elisha Gray—now made doctor of science and chevalier of the Legion of Honor—perfected that wonderful invention of the age, the telephone, the citizens of Highland Park have had it in their mind to give him some evidence of the honor in which he was held at home, and at the same time to emphasize such testimonial as they might be able to offer by the concurrent compliments of eminent scientists of the nation. The opportunity occurred last night, and, in all probability, it would not be stretching a point to observe, in the language of current journalism, that it was Highland Park's "proudest day," and that the "most notable event of the season" took place on the occasion of the reception and banquet, which were held at Highland Hall.

It should be known that Elisha Gray, a resident of Highland Park, and a gentleman of superior scientific attainments, which have led him chiefly into the investigation of electrical subjects, is the individual to whom, beyond all doubt, the world is indebted for the original invention of the speaking and the musical telephone. It is not the intention to here enter into any discussion of this subject, which has, since the claim of another scientist was advanced, been taken to the cognizance of a judicial tribunal for the purpose of deciding the claim of priority of invention; but only that is stated which Dr. Gray's associates maintain, and which nearly all the scientists in the country concede, that to his brain is attributable the invention of that idea which has fairly worked a great revolution in telegraphy, and has demonstrated the startling capacities and the wonderful adaptability of electricity in that simple, and yet almost marvelous, instrument, the telephone. The patient labor, the persistent study, the multitudinous mishaps, the failures, and the final success which crowned so many months of research and experiment, are known alone, possibly, to Dr. Gray and a few who were associated with him; but that he did eventually produce a telephone which transmitted music hundreds of miles, in nearly its full volume and original harmony, and that he presented to the public a speaking telephone, by which messages might be transmitted great distances with the clearness of enunciation of close and personal communion, is testified to by the columns of this and other papers, which, as the "right hand of popular science," as one of the toasts of the evening designates the press, were ever ready to recognize the fact—and herald it to the world—of the dawn of a new light on the scientific horizon.

Although Dr. Gray has been honored elsewhere, none have had more genuine esteem for his abilities as an inventive genius, or greater respect for him personally, than those with whom he has for years been associated in the every-day walks of life—the residents of Highland Park. And so it was that they had for a long time meditated some demonstration that should speak for them and their sentiments, and impress upon his own mind that his home held him in great esteem, which should suffer no damaging comparison with that of any other section.

It must be conceded at the very outset that Highland Park collectively, and those individually into whose hands the management of this affair was intrusted, did themselves much credit by the simple and unostentatious, and yet emphatically lavish, manner in which they testified their appreciation of genius and personal worth. Elegant in every detail that combined to make up the whole, the reception and the banquet were deserved and appropriate marks of esteem for one who has always distinguished himself by simplicity of manner and social equality with those with whom he has been brought into contact. Only a passing compliment to the occasion can here be tendered. The character of the event is borne out in the sentiments which were expressed and in the people who were present. The first reflected most intensely the warmth of the speakers who uttered them; the latter were represented by not alone the citizenship of Dr. Gray's home, but of other cities, far and near, either personally or in the cheery and sincere messages which dropped from the wires during the evening.

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The *Times* said:

Highland Park, one of Chicago's most beautiful suburbs, honored itself by tendering to its distinguished citizen, Dr. Elisha Gray, on the eve of his departure for the east on important business, a farewell reception and banquet, at Highland Hall. Dr. Gray, whose reputation is world-wide as the inventor of the musical and speaking telephone, and a score of other noted electrical instruments in practical use, has been a resident of this suburb for a number of years, and it was while a modest dweller in these retiring shades that his fame has gone out over the world. He leaves within a few days with his family for a winter's residence in the City of New York. A large part of his business is centered there just now. His home remains here. Highland Hall, one of the most beautiful and commodious buildings in the west, was handsomely decorated, and the blaze of the light, the sound of sweet music and the happy company all conspired to make the occasion one long to be remembered.

The *Tribune* said of the reception:

The reception was held in the parlors of the elegant building of the Young Ladies' College, known as Highland Hall. It was on this occasion most brilliantly lighted, and decorated with rare and beautiful flowers, and an orchestra stationed on the main floor flooded the building with harmony. From half-past 8 until nearly 10 o'clock the guests thronged the broad and winding stairway leading to the parlor floor, until at last the arrivals become so numerous that it was fairly impossible to present them in the order of their coming. Prof. and Mrs. Gray occupied a position immediately before the doorway leading to the main hall, and were assisted in the pleasing and arduous duty of receiving by Prof. and Mrs. Weston, the former officiating as master of ceremonies during the evening; and also by Mrs. W. M. Goodridge and Mrs. N. E. Swartout. During the presentation of guests a pleasing and unexpected episode occurred. The pupils of the institution appeared in the main hall, headed by Miss Maggie Fegan of Clinton, Iowa, and Miss Belle Ewing of Decatur, Illinois, the latter bearing a magnificent floral tribute, in the shape of a cross of the Legion of Honor surmounted by a crown. Entering the parlor, the procession halted in front of Prof. Gray, whereupon Miss Fegan most felicitously presented the flowers to the honored gentleman in behalf of her schoolmates.

The *Times* thus alluded to this presentation:

The young ladies, attired in their prettiest, appeared before the inventor in a body, one of them bearing a magnificent floral offering, representing the cross and crown of the Legion of Honor, with which the doctor has recently been decorated. This emblem, two feet high and a foot wide, was composed of most exquisite and fragrant exotics. Smilax formed the base, surmounted by a large cross composed of tube and tea roses, carnations and bouvardals. Above this appeared the imperial crown, also composed of rare flowers; and this, in turn, was surmounted by a tiny cross composed entirely of heliotropes. The presentation speech was as follows:

DR. GRAY: The young ladies of Highland Hall do themselves the pleasure of presenting to you this floral offering as a testimonial of their regard for you as a trustee of this institution, and as a man of science. You will recognize in its form the insignia of the Legion of Honor, the distinguished order to which you have been admitted by the French government. These flowers will soon perish, but we trust they will leave behind a fragrant memory of this occasion, and of the young friends who bring them. May you bear the cross and wear the crown.

General C. H. Howard, in his report in the *Advance*, described its effect upon Dr. and Mrs. Gray:

Dr. Gray was taken completely by surprise, and his unaffected modesty and simplicity of character were manifest in his few words of hearty acknowledgment. Mrs. Gray evidently enjoyed this little episode. Indeed, those who looked upon the happy face of the honored wife could not doubt that she had her "better half" of the enjoyment in the entire celebration of her husband's genius and triumphal success.

The *Inter Ocean* noticed the entertainment with this introduction:

The citizens of Highland Park gave a grand banquet to their fellow-townsman, Professor Elisha Gray, last evening. The festivities took place at Highland Hall, and were participated in by several hundred persons from Chicago, Milwaukee, Evanston, Waukegan, Lake Forest, Racine and other places where Professor Gray is well known to the people. It was really a very grand affair, being an assemblage of intelligent and scientific people seldom seen together in honor of one man.

The *Interior* said:

The citizens of Highland Park gave a banquet on last Friday evening in honor of Dr. Elisha Gray, the inventor of the telephone. Dr. Gray has preserved silence, while ill-informed or interested parties have given the credit of the invention to Mr. Edison or Mr. Bell. Dr. Gray's many friends therefore determined to give him a public token of their recognition, and one which should challenge public attention. Dr. Gray has met the fate which has so often overtaken great discoverers, in the attempt made to deprive him of both the honor and profits of the achievement; but which, we are happy to say, will not be successful in this case.

The descent from the reception parlors to the banquet hall was successfully executed under the judicious management of the reception committee, who seated the entire company without confusion, to the supposed satisfaction of every guest. The *Times* said:

The large banquet hall was beautifully decorated for the occasion. At the south end, on an elevated platform running east and west, was displayed a gorgeously supplied table for the special benefit of the master of ceremonies, the great inventor in whose honor the entertainment was given, and some of the more distinguished guests. Immediately in front of this table a wealth of flowers had been disposed, almost embowering it. The other tables ranged north and south. Three hundred covers were laid. The banquet was furnished by Eckhardt of Chicago, the well-known caterer, and was in all respects a superb affair, to which the assembled guests did justice with a relish and zest that bespoke not only good appetite, but a high appreciation of the delicious viands so bountifully spread out before them. A notable feature in the hall, and one that attracted universal attention, was a curious structure, one might call it a pyramid, a pagoda, or anything else, for that matter. It was, in fact, a unique wooden device, specially constructed, to display some of the numerous electrical inventions of Mr. Gray's genius, including, among other marvels, the induction relays, automatic repeaters, dial instruments for printing, the stock printer, patent cut-outs, hotel and elevator annunciators, burglar and fire alarms, musical and speaking telephones. These marvels are given in the order of their invention.

The *Tribune* reported:

These inventions were during the evening explained in detail by E. M. Barton, Esq., of Chicago. After prayer and a vocal selection by the Blaney Quartette, the guests turned their attention to the edibles, and down through the long tables each one did his share towards testifying to the excellence of the spread.

It isn't necesary to state that the guests sat long at the tables; that the supper, or banquet, was not only choice as to quality and profuse as to quantity; that the soups and the salads, the roasts and entrees, and all else besides that went to make up the bill of fare, were relished and praised in turn; that the sweetmeats of dessert and the ruddy coffee which followed after to smooth down all the rough places of appetite and give a feeling of supreme content to the individual; that everything that could be desired by the proverbial "inner man" was present at the wish, and that the banquet, *per se*, was a meal notable for the excellence of its *cuisine*.

Regarding the postprandium the *Times* said:

After ample discussion of the elegant supper, President E. B. Weston, the master of ceremonies, rapped the company to order and introduced the postprandial entertainment with a few remarks, in substance as follows:

The large assembly of friends around these tables to-night, this grand gathering of citizens and strangers, indicates an occasion of more than common significance. It is an old custom to celebrate thus, with feasting and music, with flowing bowls and flowing souls, great events of public concern, or personal interest, or social welfare. In accordance with this worthy custom we are assembled to-night, not so much in any public interest as in honor of our distinguished fellow-citizen, whose inventive genius has laid the world under obligation, by some of the most wonderful discoveries in modern science. We come to bring such testimonial as we may, to the scientific skill, the social worth and the genuine genius of our friend and neighbor, Elisha Gray. We come to indulge in a little honest pride that these important discoveries in electrical science have been made by an American citizen. That from the kite and key of Benjamin Franklin, along the wires of Morse, and through the coils of Henry, down to the telephone of to-day, this wonderful science has made its grandest progress on American soil.

We are proud, moreover, that our discoverer is a citizen of Highland Park. That while Boston and Philadelphia will go on forever dividing the honors which attach to the name of Franklin, no Boston or Philadelphia man of to-day can divide the honors of this discovery with Elisha Gray. That while Dr. Gray is ready to acknowledge the value of contemporary labor in the same field with himself, his *priority* in this vein of discovery is matter of the clearest record.

Nor shall we forget to-night the service which men of wealth have rendered to men of genius, in developing their grand ideals into grander realities. The rainbow which arches our western sky is not made up of a single color. Whatever tints of blue, or green, or rose, may have been brought out by the combinations or oppositions of cloud and sunshine, the finest result was obtained—the bow of promise crystallized to an arch of triumph—only when the "White" was duly blended with the "Gray."

But it is quite unnecessary for me to explain further the object

of our gathering to-night. Like the attorney who opens a case in court, my office in these remarks is merely to indicate some things which we intend to prove by the grand arguments presently to follow. And from you, ladies and gentlemen, as the jury in this case, duly impaneled, we expect a unanimous verdict in favor of our client.

Upon concluding his brief address, Professor Weston announced the first of the regular toasts, as follows:

"The Guest of the Evening," which was received in silence, all standing, and drinking as warmly to the health of "the guest" in sparkling cold water, says the *Advance*, as though the glasses had been filled with the wine when it is red. At any rate, it detracted nothing from the universal respect for Dr. Gray, when his pastor, the Rev. Mr. Bissell, of the Presbyterian Church, said, later on, that it was Dr. Gray's special request that no wines or liquors should be furnished at the banquet.

The second toast, "The Telephone in Its Origin," was announced, whereupon S. R. Bingham, Esq., of Highland Park, spoke as follows:

MR. PRESIDENT, LADIES AND GENTLEMEN: I do not appear as a historian; but, having been requested to present to you to-night a few of the facts in the brief history of the telephone, I bring you a summary; and if this statement shall aid in the correction of error and the acceptance of truth concerning this matter by the public, we, to whom these facts have been familiar matters of personal interest and local pride, shall hail their result with enthusiasm, even though some of the names noisily mentioned among the people and in the journals of these days may be called in question with some disparagement.

If the press and the public have been misled—either by the willingness of other men to wear borrowed laurels, or the reluctance of our modest friend to demand his own—it is high time that we give to the press and the public authenticated facts, and so shall they render unto our Cæsar the tribute which to him belongs.

Many of you will recall the time—somewhat less than five years ago—when it was mysteriously whispered among us that our neighbor Gray had made a new and wonderful discovery—nothing less than the practicability of transmitting musical tones through telegraphic wire.

Some of you will recall an evening, early in the summer of 1874, when, by invitation, we witnessed at his house a demonstration of this wonderful accomplishment.

Later on, in December, 1874, a musical entertainment was given in the Presbyterian Church, in Highland Park, at which was introduced "the first public exhibition of Elisha Gray's Electric Telephone." And this was, indeed, the first demonstration to the public of the mysterious working of this marvelous thing—the fame of which, in its varied modifications, has meanwhile become world-wide.

In its infancy, the telephone, with Elisha Gray, made the acquaintance of an intelligent and resolute friend, in the person of Dr. Samuel S. White, of Philadelphia, who promptly became and has steadfastly remained its liberal patron and promoter. And to this gentleman, as also to Prof. Gray's accomplished assistant, Mr. Goodridge, the world is incidentally indebted for the early introduction and perfection of this wonderful appliance.

During the year 1874 Mr. Gray pursued his experiments, making steady progress in the development of this invention, and securing his rights under the patent laws of the United States, Canada and Europe.

During 1875 his investigations brought him, step by step, to the production of the speaking telephone, and on the 14th of February, 1876, he filed in the United States Patent Office, at Washington, a caveat, setting forth as follows, viz.:

"Be it known that I, Elisha Gray, of Chicago, in the County of Cook and State of Illinois, have invented a new art of transmitting vocal sounds, telegraphically, of which the following is a specification:

"It is the object of my invention to transmit the tones of the human voice through a telegraphic circuit, and reproduce them at the receiving end of the line, so that actual conversation can be carried on by persons at long distances apart."

Then follows a reference to sundry methods previously invented and patented by him, of transmitting musical sounds telegraphically, upon a modification of which this invention was based.

Accompanying the application were pictures and diagrams, showing the form of apparatus and connections, and actually representing one person speaking into the transmitting instrument and another person holding the receiving instrument to his ear at the other end of the line; and after an elaborate description of the invention, and mention of several proposed modifications and improvements thereof, he concludes with this clear statement:

"The obvious practical application of my improvement is to enable persons at a distance to converse with each other through a telegraphic circuit, just as they now do in each other's presence or through a speaking-tube."

This, my friends, was the origin of the speaking telephone, and there is no evidence whatever that, prior to this date, any other man than Elisha Gray had constructed, designed or described any apparatus whatsoever for this purpose.

On the same date Alexander Graham Bell, of Boston, made application for letters patent, setting forth "certain new and useful improvements in telegraphy," and relating particularly to multiple transmission; but in the full description of his invention—covering several pages and accompanied by drawings—it is not claimed or intimated that the apparatus in question could be used for the transmission of articulate speech, nor that he had been able, or ever expected to be able, in any manner to transmit conversations telegraphically.

It is true that, subsequently to the date of Mr. Gray's caveat, Mr. Bell devised a modification of the telephone, as originally designed by Mr. Gray, by substituting in place of the transmitter, shown in Mr. Gray's drawing, the same instrument shown by him as a receiver, which, at that time, was a valuable improvement.

In January, 1877—nearly a year later—Mr. Bell made application for a patent, covering practically the same patterns and specifications contained in Mr. Gray's caveat, on file at the time, and, strange to say, the patent was issued, the Examiner subsequently explaining the strange transaction, it is said, by stating that Gray's caveat had been overlooked. Of course, the patent so obtained is, by law, void and worthless, and only remains to be so declared whenever a test case is reached in the courts.

If it is asked why Mr. Gray did not at once prosecute this feature of his invention, it is answered that his especial efforts during this time were directed to the perfection of a system of rapid and multiplied transmission of messages by means of the harmonic telephone—the speaking telephone, of course, not being available for the ordinary commercial business of the telegraph.

In 1877, Thomas A. Edison, of New Jersey, introduced an improvement in the construction of speaking telephones, and is entitled to much credit for what is known as the carbon telephone, which is an excellent transmitter, as also for the ingenuity displayed in his adaptation of the telephone in that curious instrument, the talking phonograph, which for a time had great notoriety.

Among the scientific writers of the day, George B. Prescott, Chief Electrician of the Western Union Telegraph Company, in a treatise on "The Speaking Telephone, Talking Phonograph, etc.," mentions Mr. Gray's as "the first articulating telephone ever invented;" and, speaking of Mr. Bell's instrument, subsequently made, says: "It will be seen that it is precisely the same in principle, and almost identical in construction, with the receiving instrument shown and described in Mr. Gray's caveat of February 14, 1876."

Mons. Du Moncel, one of the foremost scientific men of the age, and Chief Electrician of the French Empire under Louis Napoleon, in an elaborate and profusely illustrated work on the telephone, recently published in Paris, speaks in unmeasured praise of our countryman, Gray, giving him pre-eminence as the inventor; and, with reference to the caveat of Mr. Gray above mentioned and the claim of Mr. Bell, says: "Since the year 1874 Elisha Gray had been occupied with a system of musical telephones, which he wished to apply to telegraphic multiple transmission, and the investigation which he carried on for the purpose of establishing this system under the best possible conditions caused him to recognize the possibility of transmitting, electrically, articulate words," etc.

Then, mentioning the date and particulars of Mr. Gray's caveat, and Mr. Bell's application of the same date (upon which, by the way, it is now attempted to found a claim to this invention), says: "The few words in that patent (Bell's) which could refer to the articulating telephone, related to an instrument which, by the acknowledgment of Mr. Bell himself, could furnish no satisfactory result. In the caveat of Mr. Gray, on the contrary, the application of the apparatus to the electric transmission of speech was the only thing that was indicated. The description of the system is complete, and the drawings which accompany it are so precise that a telephone constructed in accordance with them works perfectly." And again, on the same subject, Du Moncel remarks: "We have seen that, if Mr. Bell was the first to put in practice the speaking telephone, Mr. Elisha Gray was the first to conceive the principle of that instrument, and to combine it, like a consummate electrician."

But, if there were a doubt remaining as to this question, we have a significant and sufficient answer in the fact that the American Speaking Telephone Company—now extending their immense business throughout this entire country—was organized, by the shrewd and wealthy management of the Western Union Telegraph Company, solely upon the basis of Elisha Gray's patents, all other claims having been first thoroughly investigated and rejected as of no value.

And now, my friends, in the light of these facts, we appeal to the intelligent press and the generous public for the recognition of our honored friend in his own land, which, unsought here or elsewhere, by him, has been promptly accorded him abroad. We congratulate him upon his flattering recognition by the scientific men and the Government of France. We hail him as *our* "Chevalier of the

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Legion of Honor." We congratulate the people of this charming hamlet, among whom is his pleasant home—and the people of Chicago, among whom his wonderful work has been wrought—upon the renown his name and fame have brought to them. We congratulate the Christian people of this land that one whom the Church has trusted, loved, and honored, has, by his achievements and his gentle life, added luster to the cause of truth; and now, whatever the voices of men may utter to-day, we commend him to that future, when, in the history of this mysterious science, along with Franklin and Morse, his fame shall be assured, and the children shall read in the school books and upon the monuments, the honored name of Elisha Gray.

"The Telephone Abroad," the next toast, was fitly responded to by C. H. Haskins of Milwaukee, himself a skillful electrician, who spent a portion of the last summer in Europe, and very naturally kept his eye upon his favorite department at the Paris Exposition. The *Times* said:

Mr. Haskins' remarks were among the most felicitous of the evening, and called for repeated and hearty applause as he described the troubles experienced in introducing the telephone in Europe. But every obstacle was at last overcome, and to-day there is not an electrician in that country but will receive Elisha Gray as a brother. We regret that Mr. Haskins' remarks are not more fully reported, since they show that Mr. Gray has no more cordial and efficient co-worker in the electrical brotherhood, and no one more capable of enlivening the sober aspects of his theme with the brilliancy of his own wit.

"The American Patent System" was next announced, and S. M. Millard, Esq., of Highland Park, called upon to respond. This gentleman traced the patent system from the earliest record, in the reign of Edward III., down to the present time, and held that, while in that day all failed in their search for the philosopher's stone, it had been discovered at last by the inventor of the telephone.

Hon. Hiram Barber, Congressman-elect, responded to the next toast, "The Telephone in Commerce," as follows:

Ladies and Gentlemen: A singular combination of subjects for the purposes of a toast. The general usefulness of the telephone in the every-day affairs of life is already recognized and established. But by commerce we understand the business intercourse of nations, states and peoples. We point to our great cities as the centers of trade, where commerce holds continuous court. We point to our magnificent lines of railway, stretching from ocean to ocean, across a continent, as the great royal road of commerce in her endless journey around the globe; and the mind sweeps on over the trackless waters, the common highway of commerce from time immemorial. The schoolboy instinctively recalls the days of the Mercatores who brought back to Rome from their journeys to Gaul and Britain tidings of the remote western world. In all the intensified activities of commerce, in both the present and the past, we recognize the inexorable law which binds mankind, "the millions must toil that the race may subsist;" and in all nations the commercial scepter has been the mark of national supremacy, and the banner of commerce has led the march of empire. But commerce and science are sisters, and have ever walked lovingly hand in hand. One, it is true, bold, grasping and aggressive; the other as quiet, as serene, as passionless as the "azure vault"—the gentle sister, always the sage counselor and the happy guide.

A passenger from this country to England upon a sailing vessel, in the latter part of the last century, busied himself in taking the temperature of the oceanic currents at the various stages of his progress. He used for this purpose a common thermometer attached to an ordinary sounding line—a simple contrivance, and, to the casual observer, an unimportant inquiry.

And yet that traveler, by that simple experiment, ascertained the course of the Gulf Stream; made discovery of the grand highway of commerce across the ocean for ages to come; and when Franklin arrived in London he communicated to his seafaring friends the results of his observations, and declared to them that it was only necessary to put their vessels in a certain track of the ocean to reach New York in safety in defiance of the storms of winter. The result of the experiment indicated his sagacity, and the commercial supremacy of the City of New York was from that moment assured. It is not too much to say that Franklin, with his thermometer, changed the course of Empire. But for his genius Norfolk might have been the present metropolis of this country, and the commercial supremacy of the South Atlantic coast fixed for centuries.

Commerce and the telephone; commerce and the thermometer. We have found the telephone; time may give us another Franklin, and the little instrument, the offspring of the genius of the man whom we are met to honor this evening, may yet point the course of empire.

The next sentiment, in the regular order, was "The Press, the Right Hand of Popular Science." In the absence of the gentleman invited to speak to this toast, Frederick F. Cook, of the *Times,* was called up and made a happy response.

The toast next in order was "The Clergy of Highland Park." The Rev. G. L. Wrenn, identified with the history of Highland Park from its first settlement, and pastor of the Baptist church, was called upon and responded in timely words.

The Rev. Mr. Wrenn was followed by the Rev. J. H. Bissell, pastor of the Presbyterian church, speaking to the same toast. He said in part:

I am glad that the man whom we honor to-night is a Christian. I am glad that in loving science, and loving it much, he does not forget to love Christianity, and to love it more. I am glad that he does not find the scientist in him hostile to the Christian in him, and that, in receiving the honors which belong to a distinguished scientist and inventor, he yet rejoices as a humble Christian to pay greater homage to Jesus Christ. And since his name must go down side by side with the names of Newton, Faraday and Agassiz, like theirs distinguished for high scientific attainments, I am glad that it will go down distinguished, like theirs again, for simple and devout piety. You know that the great Agassiz never was greater than when, at the opening of his school on Penikese Island, in the simplicity and humility of his soul he bowed his head in prayer. This gathering in honor of Mr. Gray reminds me that next Wednesday evening, in a little upper room in this place, there will be another gathering—different from this, smaller than this. We call it our prayer meeting. At that meeting Mr. Gray will preside. If this occasion to-night honors him much, that will honor him more. This honors him more especially in man's sight; that will honor him more especially in the sight of God.

"The Telephone in Politics" called for Col. W. A. James, as the principal politician of the neighborhood, and member elect of the General Assembly. The Colonel evidently felt that "politics" was a poor peg to hang a telephonic speech to, and, getting out of his corner by suggesting that the telephone in the late presidential campaign would have been a good substitute for cipher dispatches, proceeded to discuss the main question:

Considerable had been said regarding the great invention of our own townsman, Prof. Elisha Gray. I wish to add my testimony. I believe every Highland Parker feels a degree of pride in his great success, and believes that the stamp of his genius is carved on the enduring rocks of our national history, that the name of Elisha Gray will go down to posterity with the names of Fulton, Morse, Field and Edison. I believe the true politician, with the inventor, has faith in our nationality. Columbus crossed the untried Atlantic, because when first he grappled his tiller and sailed from the old world he knew by faith that beyond the sea and storm there were new lands awaiting his coming.

Faith in the nation guided Jefferson's pen and Washington's sword. Faith in the nation breathed through every sentiment of those grand orations by which the defenders of the Constitution laid bare the sophistries of State rights, and taught our people that the nation is one, born of the sovereign will of the people, higher than State, grander than section; living as nations live, its own great life of unity and power; dying as nations only can die, by conquest or armed revolution. When thus we think of the Republic, reflections become heroic; we are not building sand forts upon the shores of time, which the next tide shall sweep away. This nation has a higher purpose than to simply serve as the theater of parties and the arena of human ambition. These are not enough for us; for as sages have reasoned and martyrs have died, it must protect each man in his home and daily living, and yet leave him free to learn all that earth can teach and to achieve all that life will permit.

"Telescope and Telephone." To this toast, E. H. Beebe, Esq., responded happily.

It was now time to call to the front the inventor himself, the central figure of the evening, Elisha Gray, Doctor of Science and Chevalier of the Legion of Honor. Mr. Gray was received with reiterated applause, and with much emotion proceeded to say:

My Friends: You give me a difficult subject. I know a great deal about Elisha Gray, 'tis true—a great deal more, in fact, than I am willing to tell. I don't, however, know much about the other fellow named in the toast—the Chevalier. But, so far as my observation goes, he acts, feels, and gets treated very much as plain Elisha Gray did.

Creditors send in their bills just the same, and I don't know as there has been any change in the family government, and if it were not for the fact that an occasional outside remark reminds me, I should not often think of my title—not that I do not duly appreciate

the honor intended by those who were instrumental in conferring it. But I am not here to talk about myself. If I were capable, I should like to embrace this opportunity to make suitable acknowledgment for the assistance and benefit I have received from others in the prosecution of my work as an inventor.

The inventor of to-day receives far more encouragement and aid than the inventor of one hundred years ago. If some of us had lived in that far-off time, and had been so unfortunate as to have invented a telephone (for it would have been a misfortune at that time), the people would have given him a reception, and they would not have been content with simply toasting him; they would have roasted him.

The chief decoration of the occasion would have been two uprights with a cross-beam between, a rope hanging from the center, and a man dangling at the end of it. I thank God that we have outlived those superstitious times; and the investigator of scientific truths to-day is hailed as a benefactor of his race, rather than a wizard with evil intent, and only fit to be burned at the stake.

It is largely due to this change in public sentiment and the breaking down of superstitious ideas, that in these latter days we are making such rapid strides. It is not so much that we have more men of genius now than then, as that those who are capable and willing to work out the problems of science receive encouragement. It is to the patrons of science and art that much of this latter-day progress is due; and I wish here to mention some of the names that ought to be forever associated with the telephone, as patrons and assistants.

Among those I wish to make special mention of is the name of Dr. Samuel S. White, of Philadelphia; the man who had the foresight to see the oak when it was less even than acorn; the man who had the courage to wait, not only for the germ to grow, but to stand by and nourish it, when to do so was not the popular thing. I owe much, very much to him as a patron. He is not only White by name, but white in every other respect. Again, I am indebted to the officers and employes of the Western Union, and Northwestern Telegraph Companies, for facilities and assistance of various kinds whilst conducting my experiments. I am also greatly indebted to the Western Electric Manufacturing Company, its officers and men, for the very excellent facilities furnished by them. To Mr. W. M. Goodridge, who, since 1874, has been my faithful assistant, I am greatly indebted, not only as a skillful mechanician, but for his readiness in arranging and manipulating electrical details.

I am indebted to a great many others, but I cannot stop now to name them. There is one other, however, that I cannot pass by without a word. While standing beside my wife, receiving the congratulations of friends, I was reminded of another occasion some seventeen years ago, when I stood up beside the same woman. As a panorama of the events of that seventeen years passed rapidly before me like a dream, and as the canvas moved forward, new pictures were constantly coming into view; but in the foreground of each stood the same woman beside the same man, now dropping words of encouragement, sympathizing with him in sorrow, rejoicing with him in prosperity, and aiding him in a thousand ways as no other could. Whatever success I may have had, how much I owe to her shall be decided by the husband who knows that he has the best wife in the world; and I see more than a hundred husbands now, who are ready to swear, each, that he will be called upon to render the decision. Yes, I owe much to the love of a woman.

Now I come to the most difficult part of my speech. To you, my friends here in Highland Park, what shall I say? Words are so tame—so meaningless. The best framed sentence, the choicest phrases, seem to mock my feelings, and I shrink from any attempt at expressing them. I can stand up under reproach, or battle with the storms of adversity; I could even in the discharge of duty stand exposed to the fire of an enemy in battle without flinching; but when you, the friends and companions of my every-day life, make me a target for such numbers of kindly missiles, you make a woman of me and I surrender, for I have another soft place besides the one in my head. Any honor that has been or could be conferred by kings or nations dwindles into utter nothingness when placed beside these kindly expressions from you, my friends at home. It is said that a prophet is not without honor save in his own country. The saying is in the main true, but it is the exception that proves the rule, and I am proud, yes, doubly proud, to be able to furnish the proof that the rule is correct.

I cannot stop without making brief mention of my colaborers in this branch of invention. The names of Bell and Edison will always be associated with the development of the telephone, not as first inventors, but as having contributed valuable improvements; and although much credit has been wrongfully bestowed, I do not wish to detract one iota from the praise that is justly due them.

My friends, I thank you on behalf of the thousands of scientific investigators who are plodding along, consuming the midnight oil, digging up crumbs of truth, here a little and there a little, all of which are gathered into the common reservoir of facts, out of which the world drinks wisdom and by which mankind is elevated and the creature is brought into closer relations to the Creator. I thank you on their behalf for this appreciation of their work. I thank you on behalf of those who may be termed the patrons of science, those whose faith has extended to their pocketbooks; and finally, I thank you on my own behalf, from my heart of hearts, for this very kindly expression towards me. I shall try more than ever to deserve the place you have given me in your esteem. I will always be proud to say that I am a citizen of Highland Park. God bless every one of you. If I have done anything to contribute to the common good, I am glad. If I have used the knowledge I have obtained for the benefit of the world, I have only done my duty. No man has a right to hoard up anything that may be used for the general good. For

"Who learns and learns, but acts not what he knows,
Is one who plows and plows, but never sows."

"The Telephone a Social Power in the Hands of the Ladies." Professor Butler, of Highland Hall, had been invited to respond to this toast, and he did so very happily, in rhyme.

The next regular toast, "The Telephone as an Auxiliary to the Telegraph," was answered by a message over the wires, from New York, by Dr. Norman Green, President of the Western Union Telegraph Company, as follows:

MASTER OF CEREMONIES: The invention of the telephone was a grand stride in the march of progress and improvement in the great American-born act of telegraphy, and Elisha Gray deserves the homage of his countrymen for his services in maintaining the honor and ascendancy of his country, in this regard, among the nations of the earth. His meritorious claims have been fully recognized and his name enrolled on the scroll of honor by the highest scientific tribunals of the age.

As an auxiliary to the telegraph, the speaking telephone must come into extensive use for branch lines to factories, mines and small towns, and communities where the amount of business would not pay the salary of an operator, and for ready and convenient intercourse between business houses, factories, or store-houses and counting-rooms, all of which facilities for hasty communication must largely encourage and increase the telegraph business; and should the multiplex telephone prove a success in accomplishing practically what it appears to have done experimentally, "an auxiliary to the telegraph" would but faintly express its immense usefulness and importance. I regret the great distance at which I have to draw inspiration from the rich viands and good cheer of your banquet, but the theme is itself sufficiently inspiring, if I could be spared but a few minutes from current business to contemplate it.

I beg you to fill a cup to Mr. Gray and to the grand army of American telegraphers, whose general intelligence is exceeded only by their untiring devotion to the calling, and who have kept telegraphy in the United States, both in a scientific and business aspect, far ahead of any country in the world.

"Music Hath Charms," the next regular sentiment, found a fitting response in the musical telephone, which, just at the opportune moment, sent its delightful tones throughout the hall, clear and melodious, in some familiar airs played from Chicago.

C. H. Summers, master of wires for the evening, had arranged everything in his department with such admirable skill that everything, from far and near, came to time when summoned.

Prof. J. B. L. Soule, of the Classical Institute, Highland Park, next answered to the call of his name, by reading a delightful poem, entitled "Lost Echo Found," as follows:

Far in the centuries ago,
As mythic stories plainly show,
Fair Echo, Juno's beauteous maid,
Was banished from the Olympic shade,
For catching whispers near the throne
And telling secrets not her own.
Doomed never more to speak a word,
Except each last one that she heard,
With sorrowing heart she first began
To wander in the realms of man,
Wild roaming flood and field around,
Till dwindled all away to sound.
Strange spirit of the vagrant air,
Now hidden in some sylvan lair,
Now shouting on the trackless hills,
Or moaning by the solemn rills,
Loud laughing at the waterfall
Or mocking at the wild bird's call—
A life no language can define,
Between the human and divine,
Men long have sought but never found
This joking image of a sound.
But now, long live in quiet joy
The modest sage of Illinois,

Who, far from ancient haunts of Pan,
By the blue waves of Michigan,
Has first of all the hearts that sought her
Decoyed the wily maid and caught her,
And broke the cruel spell that hung
Around the mysteries of her tongue,
And taught her wondrous arts, that reach
Beyond the power of human speech—
To utter secrets swiftly sent
From continent to continent,
And bring again to mortal ears
The long lost music of the spheres—
Those early harmonies that rung
When morning stars together sung,
All blending in the mystic tone
Of the celestial telephone!

The Rev. Dr. Worrall of Chicago responded with eloquence and power to the last toast of the regular series: "Science and Religion, According Tones in the Harmony of the Universe."

Earlier in the evening the Blaney Quartette—including W. M. Goodridge, Dr. Gray's right-hand telephonist—added very much to the entertainment of the guests by their admirable selection and rendering of songs adapted to the occasion. The artistic arrangement of Gray's electrical inventions was also made by Mr. Goodridge's practiced hand. In addition to the singing of the quartette, excellent instrumental music was discoursed, at intervals during the reception and banquet, by Beekman's Band of Chicago.

About this time in the morning music was beginning to lose its charms, and talking as well. A few sentiments still remained in the hands of a few gentlemen, but were presented very briefly, with small comment.

S. M. Millard, Esq., proposed, "The Highland College for Women—Highland Hall—devoted to the education of our daughters; long may its banner wave," and called upon H. T. Helm, Esq., of Lake Forest, to respond. Mr. Helm replied briefly and to the point.

Mr. Spencer offered, "Mrs. Gray, the Fit Companion of Sir Elisha, in a Home Made Musical by the Telephone." Received with applause.

S. M. Millard presented, "Highland Park to Menloe Park: What Are the Wild Waves Saying?" By this time the wires were getting weary, and no response from "Menloe" was received.

Many friends of Dr. Gray, personal or professional, unable to be present at the banquet, sent regrets by mail or telegraph. Among this number were: Prof. David Swing, Chicago; J. H. Fairchild, president of Oberlin College; Samuel S. White, Philadelphia; Prof. L. F. Parker, State University of Iowa; President D. S. Gregory of Lake Forest Seminary; Hon. William Henry Smith, General Agent Associated Press; Prof. H. S. Carhart, Northwestern University, Evanston; Norman Williams, Chicago.

Many messages of regret were received by telegraph on the night of the banquet and read to the audience in installments. They came from as far away as New York and San Francisco, from the following persons and societies: American Electrical Society; James Gamble, General Superintendent Western Union Telegraph Company; C. B. Prescott, Chief Electrician Western Union Telegraph Company; Chicago Electrical Society; Hon. J. H. Wade, ex-President Western Union Telegraph Company; R. C. Clowry, St. Louis; Hon. J. D. Caton, Ottawa, Illinois; Hon. George Walker, President American Speaking Telephone Company; E. P. Wright, Cleveland; Moses G. Farmer, Boston; Cleveland Electrical Society; Anton Stager, Vice-President Western Union Telegraph Company; Toledo Electrical Society; J. D. Reid, Secretary, A. S. Brown, Superintendent Telegraph, A. S. Downer, Manager, G. & S. Telegraph Company, New York.

It was only natural that the Gray banquet should have awakened echoes of various sorts in the American press. Most of these were in harmony with the occasion, while others were slightly toned in the interest of other inventors. Some had the voice of Bells, a little jangled and out of tune. The committee in its report of the banquet said that it did not deem it worth while to discuss these expressions of interested parties, as all things would be settled before long by the proper authorities.

The final meeting of the committee was held on the Monday evening after the banquet, at the house of Henry C. Carver, with C. H. Summers in the chair. These two gentlemen are entitled to special mention as originators of the movement, and liberal contributors in various ways towards its success. The committee went into a general review of the campaign so successfully ended, summed up the deficiencies in the several departments, and provided the ways and means. Each member of the committee, and all others concerned in the management, found ample reward for the labor and time devoted to the entertainment, in their own enjoyment and that of their distinguished guest, to whom the words of the immortal Shakespeare so aptly apply:

"Thou in this shalt find thy monument,
When tyrants' crests and tombs of brass are gone."

UNDERGROUND CONSTRUCTION.

The People's Telephone Company of Knoxville, Tennessee, is extending its underground system throughout the city.

The Northwestern Telephone Company of St. Paul has been authorized to place its wires in certain streets in underground conduits.

The Fort Dodge (Iowa) Telephone Company will put in an underground system at once. It will also construct several more rural lines and extend its system generally to take care of its growing business.

The Providence Telephone Company has asked the board of selectmen of North Attleboro, Massachusetts, for permission to construct an underground conduit system through the center of the town for its wires.

The Home Telephone Company of Bloomington, Illinois, has just completed the stretching of a new underground cable on Jefferson street, between Main and Madison streets, to accommodate new service in the business district.

The Utica (N. Y.) Home Telephone Company is getting ready to put in 8,000 feet of underground cable and to enlarge its main distributing rack. The addition to the switchboard, which accommodates over 800 additional subscribers, is nearly completed.

Manager Allen of the local telephone company at Bismarck, North Dakota, contemplates the placing of all telephone wires underground in the down town district. It is the intention of the management to adopt all modern appliances and devices and maintain the system at the highest standard of efficiency.

The New Telephone Company of Indianapolis is preparing to lengthen its underground system and has filed two plats showing the extent contemplated. As soon as the material is purchased work will begin. When this work is completed a large area of the central portion of the city will be occupied by the conduits.

The Dunkards at their recent gathering near Dayton, Ohio, disclosed a peculiar antipathy for two very popular things—the telephone and newspapers. They took the peculiar position of being opposed to both. It was argued that the telephones brought the brethren into close communication with the world, as did the newspaper, but there were at least two redeeming features of the latter—the market reports and the weather forecast. It was advised that the use of the telephone be abandoned, but the conference did not make the rule mandatory, and the more progressive of this sect will continue to employ it in the channels of trade and sociability.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

There has been lately installed and put in operation an interurban railway between our city and a city fourteen miles to the west, the company giving local service in both cities. By Figure 1 you will note the relative positions of our lines to the railway. The lines are all grounded bridged farmer lines running into a metallic board of Kellogg manufacture. Since the railway has been in operation the drops on all the lines stay down nearly all the time when there is a car in motion in our city, the armature of the drop being strongly held, while the current on the line, so far as we have been able to determine with a common pocket voltmeter, measures from 1-20 to 2-3 volts. When the road was placed in operation, our cables across the bridge, shown in sketch, were in direct communication with the bridge, and consequently with the rails, but we have since insulated them by use of wooden arms. This, however, has not proven to be a remedy, as we strongly suspected. The noise or induction is not sufficient to interfere with conversation, only on the lines A, B and C. On the other lines you can hear it, but not to such an extent. But the drops are affected exactly the same. The only possible reason we have been able to evolve was that we were getting a sort of electrolytic action; that the current was leaving the rails at our central office ground and following over our lines, through the telephones at *A* to the ground, and thence to the rails, but if this were true, why should the drops on the *X, D, E, F, G, H* and *I* lines be affected? Acting, however, on this theory, we connected the *A* line with our ground at central and with the rails where the *A* line crosses six miles west, hoping that, in that way, we would provide a circuit good enough to carry all the current, leaving the remainder of the lines free from it. This, however, did not seem to make a particle of difference. The power house for the line is located at the city west, and in reaching the conclusion it should be borne in mind that the lines on the sketch are all affected the same way, with the exception of the lines *A, B* and *C*, which are noisier than the rest. What is the cause and remedy?—L. A. P., D., Ill.

This is a case of the lion and lamb in real life—they cannot lie down together any more than voice currents and railway earth currents. It is needless to say that the railway earth currents take the part of the lion. The act of making circuit *A* act as a common path was a step in the right direction, but the wire has too high resistance to short-circuit all the drop of potential existing throughout that six miles. Such a device would necessitate a wire of immense size, under the conditions shown in figure. The pressure of the current passing through these circuits is much more than one-twentieth of a volt, for that would not affect a drop, nor visibly retain an armature placed against the core of the drop. It is possible that you have measured the current passing through the circuit. I have seen conditions of this kind where a difference of potential ran up to fifty volts. It is evident that the conditions in the figure will reveal a possibility of the voltage running up to fifty volts, at least, which, of course, will lock any drop. At the time that no cars run, there are no differences of potential existing at these points six miles apart, and the drop stays up. The change at the bridge had no effect, as it is not a part of the contrary conditions. The cable being insulated would not help, but the insulation of the line clear through would make it quiet. This means a well balanced circuit, metallic and well transposed. But the great trouble in this case is not inductive, but conductive—that is, the flow of the return current through the grounded telephone circuit. Therefore, a common return would be the next importance in the elimination of the trouble. But both these devices or arrangements cost money, so let us see what next step will help.

The next plausible step would be to make use of the condenser. This certainly will cause the direct current to cease flowing through the circuit, and to prevent the drops from falling, or being locked when a car is in motion along the railway. But the noise cannot be stopped to a great degree because this condenser cannot stop the noise producing current, as that is varying, or undulating, or even alternating in character, and the condenser offers a ready path for the noise producing current. As the stopping of the locked drop trouble would be of some value, the disposition of these condensers shall be considered. At first thought, it can be remedied by placing a bank of condensers directly in the exchange ground. As the system is local battery, nothing but alternating currents are used, and a condenser of twenty microfarads capacity would help out all ringing and transmission.

The next place to place these condensers would be right in the drop circuit, possibly of four microfarads capacity, so that the drop could be rung down readily. As the drop

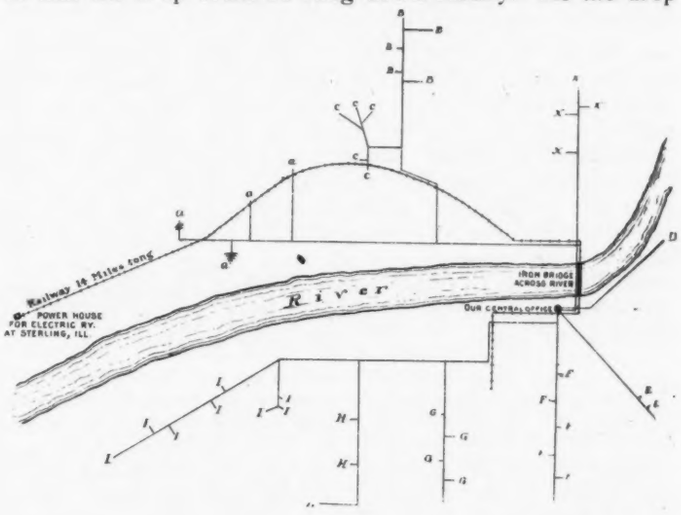


FIG. I.

is cut off during use, it might be necessary to place the condensers right in the line at any convenient place. This would protect the clearing out drops. It is evident that the use of condensers is but a makeshift, and not a complete relief. The noise cannot be stopped, but the service will not be interrupted by non-operative drops. Condensers cost from $0.80 to $1.50 each, and I would suggest the trial of a few lines first, before considering the adoption of condensers entirely. Metallic service is the panacea of all the evils described, and no process short of this can give complete satisfaction.

Acting on the above suggestion, I procured ten two microfarad condensers, and cut them in on the ground at the exchange, which did no good, I assume, for the reason that the lines still got a ground through the other lines on the board. The condensers cut in on the individual lines, however, have the desired result, with the exception that it does not cut down the noise, but the drops stay all right. It takes three condensers of two microfarad capacity to make the ringing good, which would be rather expensive to equip twenty lines in this manner. There is one question in the former that you did not answer, and that is, why are the drops running away from the road magnetized? I can readily understand why the lines running in the direction of the road are disturbed, but why

these other lines are is unsolvable to me. The only reason that I can bring forward is that we had a poor office ground, and I have connected the ground with a water pipe, but that made no difference. If you will refer to the figure, it will help you to know that the drops on *E, G* and *H* are more strongly magnetized than the others, and, in fact, the drop on line *B* has behaved better than any other line, while its noise is worse than *E, G* and *H*. Another thing—it seems to me, if the trouble is a species of electrolytic action on the lines *A, B* and *C*, that if we could get the current off of those lines it would be off the other lines. Would that be the case? Do you suppose that if we were to build lines *A, B* and *C* metallic, that the trouble with magnetized drops and noise on the other lines would be overcome?—L. A. P. D., Ill.

The above is a continuation of Question 1. This is a phase in the life of every telephone operator, sooner or later, as the interurban lines are inevitable. The question of making *A, B,* and *C* metallic to help the other lines can be easily answered by looking at the figure. If anything, lines *G, H,* and *I* are in as bad a position as *A, B,* and *C*. It might be reasonable to conclude that if the lines *A, B, C, G, H,* and *I* were made metallic, the others might be helped. The reason that all lines are affected in regard to locked drops is, that the return of currents to the power house is not necessarily a straight line. It may wander miles to the side, or even beyond the apparent end of the line. If you would string a wire between two stakes in the ground, a mile or two miles to the right or left of the system in figure, you can hear the cars start and stop, and if you have a sensitive voltmeter, you will detect a deflection of the needle. And it is likely that your voltmeter would show a reverse deflection if placed in lines *F, E, D* and *X*, showing that the street railway current is flowing in a direction opposite to *A, B, C, H, I* and *G*, and would prove to a certain extent that neither rails or river offer the best return. The fact that drop of line *B* behaves better than the others shows that its subscribers are removed the farthest from the return zone, and that the excessive noise is partly due to electrostatic induction, which would prove that of all the lines necessarily metallic, *A, B,* and *C* are the ones. I consider this problem one of the most important that faces the operators all over the country. All must cope with the deadly earth current, and all must change to return, or metallic service. If any reader has had experience in this difficulty, I would be pleased to have all the readers of TELEPHONY know of it through these columns.

Have just been appointed civil engineer for the B. C. Telephone Company and am desirous of finding reading matter upon underground conduit work. Can you refer me to any books?—J. A. C.

Some time in the spring of 1902, A. V. Abbott had a very fine article in the *Electrical World and Engineer,* which was in supplement form. This is seemingly the best article known. Later he published a book called "Telephony," in six chapters. One of the books is devoted to the question at hand, but at present I am not able to tell you which one. I will also refer you to Kempster B. Miller's book, "American Telephone Practice," which is soon to be brought out in a late revised edition. For general excellence, I am of the opinion that "Telephone Principles and Practice," by Wilder, will have a place near the first.

Are there any successful selective ringing systems having more than four parties? I don't mean those systems having dials, etc., that have to be manipulated, but one in which eight or ten parties can be called from an exchange with only the usual key operation of the operator.—B. F. Tel. Co.

Four parties on a sound selective basis seems to be the limit. There are many systems drawn on paper that are supposed to handle eight or ten parties, but it is a safe bet that in practice, the operator would want to murder the alleged inventor before he put very many lines in operation. When such companies as the American Electric, Kellogg, Sterling, and others of national importance, limit their practice to four selective parties, you may be sure that four parties are the limit to safe and reliable ringing. Most of the alleged systems are made up by persons lacking in ordinary knowledge of electrical laws, and conditions of ordinary operating. For city work, limit yourself to four-party selective service. If ten-party lines are necessary, use split non-selective ringing, that is, five parties on each side of the line. By all means make the service as bad as possible, so that ten-party practice will either be abolished or deserted, and subscribers willingly take to four-party, or be forced to do so. Ten-party selective service for city telephone service is absolute folly. Think of what cheap service it would be, and think of the cost of maintaining ten-party lines? I have known the best inspectors to hunt for two days on a short-circuited condenser of one telephone of a ten-party line service. Scattered over such a wide area such a line is bound to be affected by atmospheric discharges, and even if protected at the subscribers' stations by carbon arresters, a man must be sent around to clean the carbons. For a man or company of men to think that such a thing as a ten-party city exchange selective service would be worth putting on the market, shows gullibility or ignorance of operating conditions about the country. By all means, don't inflict yourself with a ten-party selective service. Four parties will give you trouble enough.

We have a metallic line, well transposed, ordinarily quiet, on the same poles as the high tension feeder wires for the interurban road, between the high tension and trolley wire feeders. We have best of service, ordinarily, but the other day, when we needed the service the most, we could not use it at all on account of the great roar in the telephones. Coincident with this, one of the three wires of the high tension feeder was found to be down and grounded. What is the connection between these facts, for there was no cross between the telephone wires—they simply were in their normal position, and untouched by the fallen feeder? If there is any connection between this incident of noisy lines and grounded high tension feeders, what can be done to prevent the trouble on the telephone lines, as this is just the very time that service is needed the most?—W. M., Ind.

Yes, there is a coincident trouble. I will assume the following conditions: A 26,500 volt three-phase power system, with rotary converter stations at intervals of sixteen miles, with telephone service connecting the rotary converter stations with each other, and with the chief engineer's station at the prime mover station. It is safe to assume that the telephone line is nicely built, put on ordinary glass insulators, running into the stations with bare copper wire, and into the interior of the stations with twin wire, in contact with the building, in ordinary language, not insulated, except through the okonite insulation on the wires. Let us assume how the high tension wires enter this same station. Nowhere do these three high tension wires touch the building, and nowhere do they depend on pony glass insulators, but on the best and most thoroughly tested porcelain insulators. Observe the contrast. You will say, why this is necessary for the high tension wires—the telephone does not need much insulation, because it is not a high tension proposition. That is where you are wrong. The telephone needs the best of insulation, not for ordinary purposes, but for the very purposes that your letter was written. For the very moment that the high tension feeder became grounded, the other two feeders immediately assumed a potential of 15,000 volts above that of the earth. The telephone wires, being close to these wires, between them and the earth, became subjected practically to the same potential of 15,000 volts. What telephone line is insulated to stand a breakdown test of 15,000 volts? Not one. This 15,000 volts soon found a weak spot in your telephone line, and through this weak spot, the 15,000 volts pressure broke to ground. Then your line became unbalanced, and the currents due to this 15,000 volt charge flowed through your line to ground unequally, as concerns the bridged telephones, and great noise ensued. To protect the telephone lines, high insulation must be resorted to. That is expensive. Between the line and the subscribers' stations, a repeating coil could be placed, insulated to a breakdown stress

of 15,000 volts or more, which would protect the grounding at some of the weakest spots. It is doubtful if the line itself will stand such a breakdown stress. None of the present market coils will stand a stress of 15,000 volts or more. The fortunate thing is that the high tension wires seldom get out of order, because they are so well built primarily.

The origin of this 15,000 volts potential with respect to earth, when one leg of the high tension wires become grounded, is this: In a three-phase circuit, the 26,500 volts represents the pressure as a whole. Between each wire of the three-phase circuit, the potential existing is but fifty-eight per cent of the whole. As a whole, the three wires have zero potential with respect to earth. When one of the wires comes into contact with the earth, the other two wires, each at fifty-eight per cent of the total voltage, stand above the earth at their normal positions, with fifty-eight per cent, or 15,000 volts potential, higher than the earth on the third wire. The telephone wires underneath make the intervening medium act as two condensers in series, and the telephone wires assume a potential in a ratio of their respective positions between the wires and the earth. Being close, it is plain that the telephone wires have a potential near to that of the two wire legs, which are not in trouble. The telephone circuits cannot stand such a stress, or strain, and they break down quickly, with the noise you have mentioned.

We have twenty-five trunk lines between our two exchanges, five miles apart, in cable half the distance, but paralleling the trolley the other half, as overhead wires. Some of these trunk lines are absolutely quiet, others have a slight noise like the hum of generators, trolleys, etc., while there are some which are noisy all the time, and a test reveals everything in good order. Why is this? Another thing, a trunk line open on one side is as noisy, or even more so, than a line grounded on one side. Why is this? Another peculiar thing is that a grounded trunk, or one open on one side, is not noisy after the trolley system has shut down. A ground is a ground, it seems to me, and should make a trunk line noisy, whether the trolley system is running or not. Our long lines are not affected this way. A ground has the same effect at any time of day or night.—C. M.

A paralleling trolley system acts like a watchman, and reports quickly and plainly the condition of the trunk lines. The lines that are normally very quiet are those that are absolutely, or I might say, exactly well balanced, at least enough to make one side of the metallic circuit present equal resisting effects to the disturbing wire as the other side. The lines that have the slight hum are those that are not as well balanced. An equality between the resisting effects of the two sides to the charges from the trolley wire does not exist. This might be due to some inequality in the fuse resistance, or to the joints. When we have assumed that transpositions are right and the line test right, regarding insulation, then nothing remains but the inequalities in the resistance of the pair of wires. Such would be hard to find, as the slight noise indicates a small difference. An indication of this inequality effect would be to connect one of the very quiet trunks to ground through non-inductive resistances, say, 100 ohms on one side and 101, 103, 105, 107, and so on on the other side. You could then realize the importance of balance. Or you could have an assistant out on a cable pole, insert small resistances on one side of a quiet circuit on which you are listening with bridged receivers, and it is safe to say that one ohm on one side will make a noise. You could experiment on your noisy trunks, by inserting different resistances on one side, or the other, until you had secured an ohmic balance, which would indicate itself by the trunk becoming quiet.

The open trunk line is noisy, because an infinite resistance has been inserted on one side of the line. As five ohms or ten ohms make a noise, it is plain that an open will make the worst unbalance. The reason that the grounded lines and open lines are noisy, particularly when the trolley system is in operation, is, that at all times during its operation the lines are subjected to an electrostatic stress, as long as they are in good order. When a line grounds, the electrostatic stress becomes a strain, and the great charges flow to ground from all parts of the circuit. The bridged telephones are in the path of this flow to ground, and as it is their business to interpret currents into sounds, you hear the noise of generators, cars, etc. In the open line, the charges try to reach an equilibrium, and in doing so, have to pass through the bridged receivers. When all conditions are balanced, it simply means that equilibrium is brought about without the currents of the charges flowing through the bridged receivers.

At night, when the cars are not running and the system shut down entirely, the wires are not subjected to an electrostatic stress at all. Consequently, when a ground or an open occurs, there are no great charges rushing to earth throughout all the circuit, through the bridged receivers, and no noise of any volume occurs. But this applies to short lines only. The toll lines pass through great stretches of country, and are bound to acquire charges of electricity. When a ground or an open happens, there is a rush of these charges to the weak, or grounded spot, and noise results.

INDEPENDENT DEVELOPMENT.

The development of the Independent telephone systems has been one of the marvels of the closing years of the last century, and to-day the Bell company has fairly entrenched opposition, in Independent companies, in every city in Iowa, as it has in every other state in the Union. Iowa is one of the strongest states for Independent companies, this state being a veritable network of them. Through their associations they are brought together and arrangements perfected for making use of each other's toll lines, so that now communication is possible through the medium of the Independent companies, between the most distant cities in the state.

All this has come within the last ten years. The expiration of patents held by the Bell company broke the monopoly it had and opened the way for the Independent companies. In the eight years ending with January 1, 1903, articles of incorporation were filed with the secretary of state for over 1,200 Independent companies in Iowa, and over 200 were added last year. When it is considered that the capitalization of these companies ranges from a million dollars, in cases like the United States Company, of Waterloo, and several others, down to the $25,000 to $50,000 necessary to install an exchange in one of the smaller cities, some idea can be had of the vast amount of capital that is involved. Every company is backed by the merchants, bankers, farmers and others of its community, and taking an average of ten, which is very conservative, of stockholders to each company there are upwards of 20,000 Iowans interested in Independent telephone companies.

Through the medium of association these companies are banded together. As there is the Northwestern Iowa Association, for this section of the state, there are the Southwestern, Southeastern and Northwestern Associations for those divisions of the state, and a State Association taking in the members of the four divisions.—Dubuque (Iowa) *Enterprise.*

A new device to be placed on switchboards automatically records the time taken for the making of a connection. In this way if complaints are made that connections are not made promptly, the company can immediately discover just how delays arise. The records thus made also enables the chief operator to know whether the telephone girls are attending to their duties.

Strowger Automatic System. II

F. LUBBERGER

IN THE system as described in the July issue of TELEPHONY, every subscriber is to be called by two digits—a ten and a unit. So the numbers one to nine cannot be used. In order to get 100 numbers a cipher is prefixed to the first ten units, so that the numbering starts with 00, 01, 02, etc., and ends with ninety-nine. Not more than 100 subscribers can be accommodated by the connector alone, and the question arises how to increase the capacity of the switchboard. The principle is seemingly very simple. Suppose in a plant of 10,000 subscribers No. 5327 wants to call No. 3596. The line No. 5327 ends again in a connector with the difference that this connector has no generator relay. The subscriber calls first three. His connector is raised to the third row (we will call such a horizontal row a level); then the subscriber calls five. His connector is rotated by five steps and the sideswitch is switched onto the contact *C*. By this the line No. 5327 is connected to the bank contact No. 35. Instead of connecting another subscriber's line to these contacts, another switch is attached to the latter. Next the subscriber calls nine and the secondary switch steps up to the ninth level. Next the subscriber calls six and his line is connected to the contacts No. 96 of a secondary connector attached to contacts No. 35 of a primary switch. The secondary switch has a generator relay and the subscriber pushing his ringing button rings No. 3596.

In practice this arrangement of trunking is impossible. It would mean 100 secondary switches to one subscriber. For automatic purposes a trunking capacity of 10 per cent is ample, i. e., suppose we group 100 subscribers' switches on one frame. If there are 1,000 subscribers we would have ten so-called switchboards. Each group is adapted to be called over ten trunk lines and members calling out of the group into other groups shall not use the incoming trunk lines. The subscriber's switch in a system having more than 100 members is designed in a way somewhat different from the connector as described above, and has another name. We call a subscriber's switch in a system above 100 members a first selector. The appearance of a first selector is the same as shown in the illustrations given for a connector above. The wiring of a first selector is shown in Figure 1. Attention is called to the addition of two mechanical parts—a fifth sideswitch and a hook *H* attached to the rotary armature. In Figure 1 the rotary magnet is shown in its proper place and in dotted lines a second time in order to show the hook attachment. This hook engages the upper armature of the private magnet so that this private armature is pressed down every time the rotary magnet attracts the rotary armature with the attached hook *H*. For operation of such a first selector a pulsating direct current is required. A small motor drives a wheel, the one-half of which is insulated and the other half grounded. A spring bears against the wheel. By this arrangement the spring of the fifth sideswitch is grounded about twenty times a second. We notice that the 500-ohm resistance coils belonging to the vertical *VR* and rotary *RR* line relays are attached on the contacts *A* of the sideswitches *1* and *2*, and that the normals are also attached to the contacts *A* of sideswitches *1* and *2*. The diagram shown in Figure 1 is the complete wiring as used in a good many exchanges.

Suppose there is an exchange of 750 subscribers and subscriber No. 312 calls subscriber No. 527. The telephones are the same as described above. Subscriber No. 312 rotates his dial from point five. In revolving back five impulses are sent over the vertical line and one impulse over the rotary line. The vertical circuit is as follows: Ground in the telephone, vertical line, vertical line relay *VR*, sideswitch *2*, contact *A*, vertical resistance *VRs*, main battery and to ground. The rotary circuit is: Ground in telephone, rotary line, rotary line relay, sideswitch No. 1, contact *A*, rotary resistance *RRs*, battery and to ground. The five vertical impulses energize five times the vertical magnet by the following circuit: Ground, spring *S1*, vertical magnet *VM*, contact *A*, sideswitch *4*, battery and to ground. The rotary impulse energizes the private magnet *PM* over spring *S2*. The rotary impulse causes the sideswitch to be thrown over into the second position. The vertical magnet *VM* is disconnected and the circuit for the rotary magnet is closed over sideswitch No. 5. As soon as the spring at the interrupted wheel touches the grounded side, the rotary magnet will be energized. By attracting its armature two distinct motions are effected: (1) the shaft is revolved by one step and the wipers make contact with the first points of the fifth level; (2) the hook *H* presses down against the private armature *PA* and by this the sideswitch is thrown from position *B* to position *C*. In other words, upon the subscriber calling No. 5 the first selector picks out the first contacts in the fifth level and switches the power off its relays and magnets. A very important circuit is established from ground-contact *C* of sideswitch No. 3, private wiper of first selector No. 312, to private multiple line No. 1 in the fifth level.

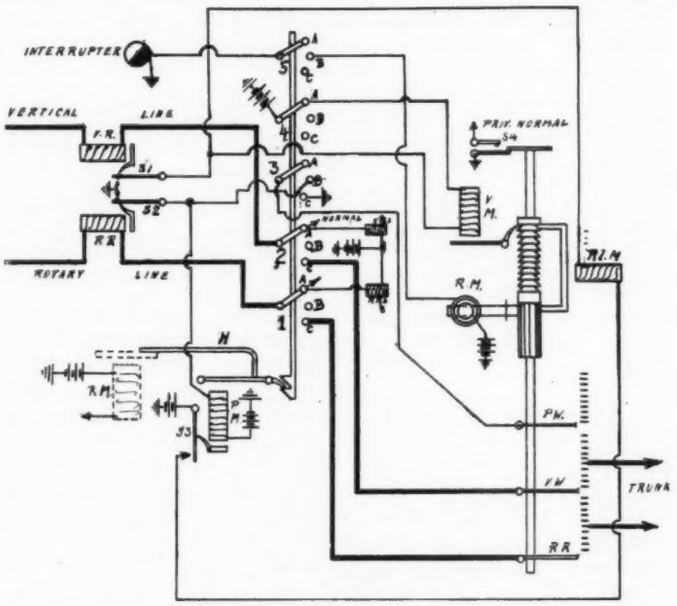


FIG. 1.—FIRST SELECTOR.

V. R., vertical relay; R. R., rotary relay; V. M., vertical magnet; R. M., rotary magnet; Rl. M., release magnet; H., hook on rotary armature; P. M., private magnet; P. W., private magnet; P. W., private wiper; V. W., vertical wiper; R. W., rotary wiper. Rotary magnet is shown twice.

A trunk line is attached to the points now occupied by the wipers of the first selector No. 312. The trunk line ends in a connector located in group No. 500. Next the subscriber pulls two, i. e., the tens of No. 527. The con-

[This is the second of a series of articles on "The Strowger Automatic Telephone System," the first of which appeared in the July number of TELEPHONY and described in a general way the working of the Strowger system.]

nector responds to this call by stepping up into the second level and by throwing its sideswitch into the position *B*. It may be mentioned here that the interrupted or pulsating power is not brought to the connector. Next the subscriber pulls seven. The connector responds by rotating seven points and finally making connection between subscribers No. 312 and No. 527. Next subscriber No. 312 pushes his ringing button in the ordinary way. If the line of No. 527 is already occupied the connector is released as described above, but not the first selector. So by pushing his ringing button subscriber No. 312 receives the busy sign from the connector. Suppose subscribers Nos. 312 and 527 are talking. Now subscriber No. 313 wishes to call No.

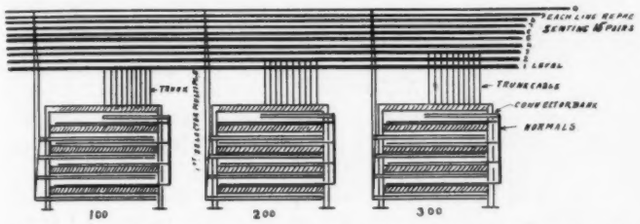


FIG. 3.—GROUPS 100, 200 AND 300 IN A 1,000 SYSTEM.

528. We know that there are ten trunks to the group 500. One of these trunks is occupied by subscriber No. 312. Subscriber No. 313 must get automatically another trunk line to group 500. First, subscriber No. 313 pulls number five. His first selector steps up five notches and the rotary impulse causes the sideswitch to be thrown into the second position. The rotary magnet will be energized and rotates the shaft by one step. Now we remember that the first selector, No. 312, already occupies the multiple line of the first contact of the fifth level, and in particular that the private wiper of the first selector, No. 312, keeps the private multiple grounded. The first selector, No. 313, after the first rotary motion touches this grounded private and the following circuit is established in first selector No. 312: Ground, contact *C*, sideswitch No. 3, private wiper, private multiple line of first contact in fifth level, private wiper of first selector No. 313, sideswitch No. 3, contact *B*, private magnet of selector No. 313, battery, and to ground. In other words, if a first selector finds a grounded private bank contact when moving the sideswitch to the second point, the private armature cannot be pulled back after cessation of the rotary impulse, because the private magnet stays energized from the private bank. As long as the sideswitch is standing in the second position the rotary magnet responds to the impulses from the interrupter wheel, and the shaft of the first selector No. 313 is automatically rotated to the second point of the fifth level. As the second private bank contact is not grounded, the private magnet of selector No. 313 loses its magnetism, the armature *PA* is pulled back by its spring and next the hook *H* on the rotary armature when making its second motion again presses down the armature *PA*, throwing the sideswitch into the position *C*, breaking the circuit for the rotary magnet. If subscriber No. 314 would now call into the fifth level the first selector No. 314 would automatically rotate to the third contact of the fifth level, because the private magnet of first selector No. 314 is held energized, first by the first selector No. 312, then when moving to the second point by the first selector No. 313.

In our exchange of 750 subscribers we have eight switchboards, seven containing 100 first selectors each, one containing fifty first selectors. The numbers in the front board may be 100 to 199; the numbers of the second board 200 to 299, etc. All first selector banks will be multiplied together over the whole exchange. The front board being No. 100 we attach to the contacts of the first level ten trunk lines and let these trunk lines end in the ten connectors located on the same board. At the second board we tap the second level multiples by ten trunk lines and carry these trunk lines to the ten connectors on the second board. We repeat the same trunk wiring at every board, each time tapping the multiple level having the same number as the board where the wiring is made, i. e., the fifth level is tapped at the fifth board and nowhere else. At each board the ten sets of connector banks are multiplied together. This multiplying is inside of one board, i. e., it is not carried to other boards. From the connector banks another set of cables—the so-called normal cables—are brought to the proper selectors, as shown in Figure 1. The cabling is shown in Figure 3.

Now I wish to repeat in somewhat different words the process of automatic trunking, as this is one of the principal points in the working of the Strowger system. We will consider the following calls: No. 234 calls No. 567; No. 463 calls No. 569; No. 536 tries to call No. 567; No. 527 calls No. 269. Subscriber No. 234 rotates his dial from fingerhole five; his first selector responds by picking out the first contacts of the fifth level of multiples. Its private wiper grounds the first private multiple of the fifth level and by this the first private contact of the fifth level in the private bank of every first selector in the whole exchange. Subscriber No. 234, whose first selector is located in the second board, is now connected to the first multiple line of the fifth level. This fifth multiple level is tapped by ten trunks in the fifth board. So subscriber No. 234, by pulling number five, is connected to the first connector in board 500. This connector responds to the next two calls of subscriber No. 234 in the manner already described. It is important to keep in mind that the first private multiple of the fifth level of first selector multiple cables is kept grounded as long as No. 234 has not released his connections, and that the connector used by No. 234 grounds the private normal of subscriber No. 567. Next, subscriber No. 463 calls into board 500, wishing to connect with No. 569. His first selector is located in board 400, where no call was originated. And yet, the first private contact of the fifth level is grounded, as we remember, by first selector No. 234 standing on the first multiple line of the fifth level. So first selector No. 463 is bound to rotate to the second point of the fifth level. Any other call going into board 500 will have to use the third multiple and the third connector in board 500. We thus see that ten calls may be made into board 500 from anywhere in the exchange.

Here the question arises as to what happens if an eleventh

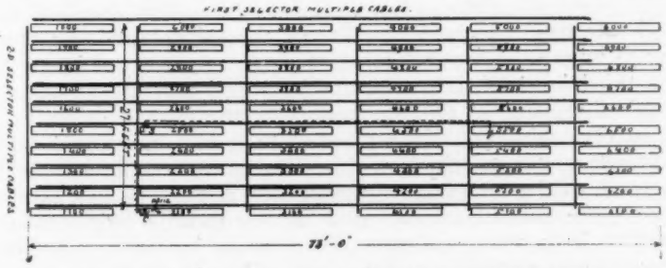


FIG. 4.—FLOOR PLAN OF A 6,000-LINE EXCHANGE.

Broken line shows call from 5,507 to 2,112. First selector No. 5,507 on first contact of second level occupies a multiple line across the exchange (broken line). This line ends in second selector five on board 2,500 This is run up to first level and picks out connector C in board 2,100. Connector C finally connects to the noraloop No. 2,112.

call into board 500 is made. I will raise the question and give the answer later on.

Next we consider the interesting facts in the call of No. 536 to No. 567. By Nos. 234 and 463 two trunk lines are occupied already. No. 536 by pulling number five will automatically be connected to the third connector in board 500. This connector responds to calls six and seven. But

as No. 234 occupies the normal lines of No. 567 the third connector is released in the manner described above and subscriber No. 463 receives the busy sign from the third connector on board 500. We must keep in mind that a subscriber calls another one in the same board in exactly the same way as a subscriber with a different hundred number. In the call to be considered next—No. 527 to No. 269—the first multiple line of the second level of first selector multiples will be used and locked. What we have to notice is that a call going from board 500 into another board does not use a connector on board 500. So even if there should be ten calls made into board 500, any subscriber in group 500 not called may call into any other board, but not into board 500, as all trunks to this board are occupied.

We wish to increase our exchange from 750 to 1,000 lines. All we have to do is to erect two more boards—the 900 and the 000 boards—and multiple their first selector banks to the first selector multiples of the boards already working. Before connecting together, the ninth level is tapped in the ninth board to ten connectors and the naught level—i. e., the level corresponding to the digit 0 on the dial of the telephones is tapped at the tenth board. To increase the capacity of an exchange does not require any changes in the existing boards. The new parts are simply attached at the end of the older ones. This is a very agreeable fact, because the cutting in of new boards does not require any work and subsequent troubles in the older part of the plant.

The combination of first selectors and connectors allows subscribers to call all numbers with three digits, i. e., 000 to 999. We proceed to study the arrangements necessary to call four digits, i. e., 0000 to 9999—a 10,000 system. It is

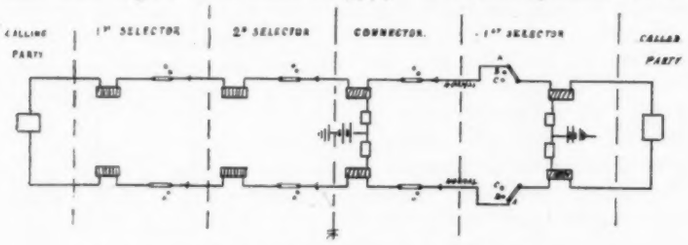


FIG. 5.—TALKING CIRCUIT IN A SERIES SYSTEM.

done by using another selector—the so-called second selector. A second selector is mechanically identical with a first selector. The only difference is that no normals are attached to the second selector. The call is made as follows: No. 5312 wants to call No. 3628. Subscriber No. 5312 first calls three. His first selector makes connection with the first free multiple line of the third level. In the group where the first selectors of 3,000 to 3,999 are located the third level of first selectors is tapped and the attached trunk lines end at the line relays of the second selectors. Subscriber No. 5312 is connected to group 3,000 and his first selector is switched off from the power. The remaining part of the call under consideration is made as described above, the second selector now acting exactly like a first selector in a 1,000 system. There must be 100 trunks to group 3,000, as there are 1,000 subscribers, and we are supposed to have a trunking capacity of 10 per cent. To provide for this trunking capacity we arrange the switches as shown in Figure 4.

We hang 100 first selectors on a board, and furthermore hang on the same board ten second selectors and ten connectors. We erect ten boards, one board behind the other, forming a group of 1,000 first selectors—say group 1,000. Then we erect group 2,000, consisting, also, of ten boards. For a 6,000-subscriber exchange the floor plan is represented by Figure 4. Now we connect in ten sets of first selector multiples, one set for each row of boards with the same hundred number, i. e., we multiple together the first selector banks of boards 1,100, 2,100, 3,100 to 6,100, and by another entirely independent set the first selector banks of 1,200, 2,200, etc., to 6,200, and finally 1,000 to 6,000, the last boards. In board 1,100 we attach ten trunks to the contacts of the first level. We repeat the same at each board from group 1,000 to 1,900. So we have 100 second selectors available for trunks into the first thousand group. At every board of the second thousand group we connect the second level of the first selector multiples to the ten second selectors. In the other thousand groups we do the same, tapping the level with the same number as the number of the thousand group. In each thousand group we multiple the second selector banks together (see Figure 4) and tap the levels of this multipling system at the board of the proper number, connecting the other ends of these trunk wires to the line relays of the connectors on this board.

Now we consider some characteristic calls. No. 5312 calls No. 2613; No. 4327 calls No. 2616; No. 3917 tries to call No. 2613. Subscriber No. 5312 calls two; his first selector is located in board 5,300 and responds to the call by picking out the first multiple line of the second level. It grounds every first private contact of the second level in the whole group of boards—1,300, 2,300, 3,300, etc., to 6,300. This second level is tapped in board 2,300. And the first second selector in board 2,300 responds to the subscriber's call of six, by picking out the first multiple in the sixth level of the second selector multiple cabling. This connects subscriber No. 5312 to a connector in board 2,600 and this connector responds to the last two digits in the well-known manner. Now No. 4327 calls No. 2616. The first multiple in the second level of first selectors is occupied by No. 5312. So the first selector No. 4327 picks out the second multiple line and is connected to the second selector on board 2,300. This second selector when responding to call six is bound to pick out the second multiple line of the second selector multiple cabling, as the first one is occupied by subscriber No. 5312. The rest of the call is made as usual. Now subscriber No. 3917 wants to call No. 2613. As no first selector in the row of 900 boards calls into the second thousand, first selector No. 3917 picks out the first multiple of this set of first selector multiple cables. The first second selector on board 2,900 responds to call six and is bound to pick out the third multiple line in the second selector multiple cabling, as subscribers Nos. 5312 and 4327 are still talking over the first two multiple lines. Now subscriber No. 3917 is connected to the third connector on board 2,600, and this connector responds to calls one and three, but is released instead of making connection, because the first connector of board 2,600 occupies the connections to No. 2613, being called from No. 5312.

We will now consider an exchange for 25,000 subscribers. I will not go into the details of such an exchange, as it cannot be expected to be very simple. The principle is certainly clear. A third selector is put in between the connector and the second selector. The first selector calls over a multiple line a second selector, which is probably located in an exchange a couple of miles away. The second selector acts now in this exchange as the first selector acted when we considered an exchange of 10,000 subscribers. There will be some changes in the system of trunking from one large exchange to another, but it would carry me too far away from the description of the principles of the Strowger system.

We will proceed to study an established talking circuit (see Figure 5) between No. 5327, as calling party, and No. 2706, as the called party. In first selector No. 5327 the sideswitch is moved to the third position and the resistance coils connecting the line relays with the battery are cut off. The same is true for the second selector. In the connector and in the called first selector No. 2706 the resistance coils are not cut off. In the talking circuit we count four series coils of thirty ohms on each side and two bridges of 1,000

ohms each. If subscriber No. 5327 hangs the receiver on the hook a releasing circuit is established from the ground in the telephone on both lines through the series coils of first selector No. 5327, then the series coils of second selector and connector through the resistance coils of the connector to battery. If subscriber No. 2706 hangs up his receiver before No. 5327 has released a current will flow from the battery and resistance coils in the connector through the series coils of first selector No. 2706 to the ground in the telephone No. 2706, but this current has no effect. In actual use such a useless waste of current is avoided by a simple arrangement in the telephone not described in this article.

One very nice feature of such a series system may be mentioned. Suppose subscriber No. 5327 wants information about which No. 2706 has to make some inquiries himself before answering, say from No. 3111. No. 2706 replies, "Wait a minute," and calls No. 3111 with the same telephone. When his first selector responds to the calls, it disconnects line 2706 from the normals between connector and first selector No. 2706, by moving the sideswitch into the third position, but the connector from No. 5327 to the sideswitch of first selector No. 2706 remains unmolested. After receiving his information from No. 3111, No. 2706 releases the connection with No. 3111 and in the same moment the old talking circuit between Nos. 5327 and 2706 is established again, as first selector No. 2706 falling back to normal position moves its sideswitch back to the first position to which No. 5327 is still connected.

(To be continued.)

INTERNATIONAL ELECTRICAL CONGRESS AT ST. LOUIS.

The International Electrical Congress to be held at St. Louis September 10 to 17—Congress week—gives every promise of being largely attended by electrical men from all parts of the world and interesting in the highest degree, as over 180 specially written papers will be read by men of national and international fame, who have made profound research into the subjects which have been assigned them. A score or more of national electrical bodies have already arranged to co-operate in the International Electrical Congress of St. Louis. In America, a number of these co-operating bodies are to hold simultaneous conventions in St. Louis during Congress week, and to hold joint sessions with specified sections of the Congress on definitely appointed days. Other bodies are not going so far as to hold simultaneous conventions and joint sessions, but have accepted their invitations to send delegates to the Congress. Invitations to send delegates have been extended to thirty national electrical and scientific bodies all over the world.

The following bodies have already promised to hold simultaneous conventions and joint sessions:

American Institute of Electrical Engineers.
American Electrochemical Society.
American Physical Society.
International Association of Municipal Electricians.
American Electrotherapeutic Association.

The following bodies have promised to send delegates to the Congress:

National Electric Light Association.
Association of Edison Illuminating Companies.

In Europe, the following bodies have promised to send delegates to the Congress:

Société Internationale des Electriciens.
Sweizerischer Elektrotechnischer Verein.

It is expected that the Institution of Electrical Engineers of Great Britain, and the Elektrotechnischer Verein of Berlin will also send delegates.

It is hoped that other European national electrical bodies will also co-operate. The delegates accredited to the Congress from various co-operating bodies are not expected to be called upon to vote upon any questions of national importance. All matters concerning units, standards, etc., will lie within the province of the chamber of government delegates.

All delegates of the co-operating bodies are invited to read papers before any section of the Congress they select. Such papers will be printed in the *Congress Transactions* as being offered by the delegate on behalf of the co-operating body. The paper and discussion thereon will subsequently be offered by the Congress to the co-operating body for incorporation in its own *Transactions,* if desired.

The programme scheduled for Section "G" relates to electric communication and will be of interest to all those engaged in telephone work. It is as follows:

Name of Author.	*Title of Paper.*
Senor Don Julio Cevera Baviera.	"Electric Communications in Spain."
Dr. J. A. Fleming, F. R. S.	"The Present State of Wireless Telegraphy."
John Hesketh	"A New Danger to Lead-Covered Aerial Telephone Cables."
Herr Joseph Hollos	"Simultaneous Telegraphy and Telephony."
Saitaro Oi	"Telephony and Telegraphy in Japan."
V. Poulsen	"System for Producing Continuous Electrical Oscillations."
G. de la Touannne	"Questions Connected with Rates and Management in a Telephone Exchange."
J. C. Barclay	"Printing Telegraph Systems."
Dr. Albert C. Crehore	"Rapid Telegraphy."
Dr. Lee De Forest	"Wireless Telegraphy Receivers."
Patrick P. Delany	"Rapid Telegraphy."
Hammond V. Hayes	"Telephony."
Franz. J. Dommerque	"The Telephone Problem in Large Cities."
Reginald A. Fessenden	"Wireless Telegraphy."
J. C. Kelsey	"Features of Two-Strand Common Battery Systems."
Kempster B. Miller	"Problem. Automatic vs. Manual Telephone Exchange."
F. A. Pickernell	"Telephony."
Louis M. Potts	"Printing Telegraphy."
Col. Samuel Reber	"Military Use of the Telephone, Telegraph and Cable."
Prof. George F. Sever.	"Electrolysis of Underground Conductors."
L. W. Stanton	"Economical Features in Modern Telephone Engineering."
John Stone Stone	"The Theory of Wireless Telegraphy."

F. W. Jones is chairman of Section "G," and B. Gherardi, secretary.

It is expected that the opening session of the congress and the sessions of all the sections will be held in the Coliseum building, situated in the heart of the city and therefore in close proximity to the hotels at which members will be quartered. The final session of the Congress may be held within the Exposition confines on Saturday, September 17.

Up to July 20, 1,968 acceptances to the Congress had been received, and nearly 200 papers promised. Thirty-two of these papers have already been delivered. Arrangements are now being completed for printing papers in advance of the Congress, so that all that are received in sufficient time will be ready for circulation among the Congress members at St. Louis. Efforts are being made to secure as many of the promised papers as possible in advance.

All communications concerning the Congress should be addressed to the general secretary, Dr. A. E. Kennelly, Harvard University, Cambridge, Massachusetts.

It is a pleasure to renew my subscription to TELEPHONY. I began reading your monthly with the first issue and do not intend to miss a number. Previous to my telephone business I was editor and proprietor of a daily newspaper. The combined experience enables me to all the more enjoy and appreciate your publication.—E. B. CROSBY.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

Reissue 12,232—Charles E. Scribner. Connection Counter for Telephone Exchanges.

This is a reissue of the original patent No. 680,890, dated August 20, 1901. It covers a meter system so arranged that it registers a call only when the called subscriber answers. The diagram herewith shows two subscribers' stations *A* and *B*, each of which has its answering jack *a* equipped with a register *d*. The multiple jacks *b* are not connected with the register circuits at all, but instead are provided each with a spring *b4* connected to a test battery *1*, and adapted to be crossed with the test rings *b3* when a plug is inserted. The potential of the test rings is thus raised during conversation. The register magnet *e* has two windings, one connected to the sleeve of the answering jack, *a3*, and the other connected to a contact co-operating with the armature *d'* which works the register. The talking circuit terminates in pairs of springs in the jacks, and has no connection with the sleeves. Each plug has three contacts, the sleeve contact (which co-operates with the jack sleeves) on the answering plug being connected through a third conductor in the cord to a front contact of the supervisory relay *i'* associated with the calling plug. The sleeve of the calling plug on the other hand is connected with the armatures of both supervisory relays, so that when the plug is in the test battery feeds back through the cord conductor *9* and when the armatures are back to the lamps.

In operation, the answering plug is inserted in an answering jack and the register is thereby unaffected, although the armature *d'* is thereby put to ground through contacts *a5-a4* and battery *f*. The wanted subscriber having been rung up, when he answers his supervisory relay *i'* pulls up its armature and completes a circuit from the test battery *1* by way of the test ring of the called line, back through the cord conductor *9* and wire *10* to the sleeve of the answering plug and so through the jack sleeve of the calling line and winding *e'* of the register magnet to ground. The register thereupon operates, and in operating closes the circuit of its other coil to battery *f*, which thereupon holds up the armature and renders the register inoperative subsequently.

In a nutshell, the invention lies in putting the register of the calling line under the control of the called line, and that for one operation only.

Trade Mark 42,925—The Controller Company of America. Devices for Receiving Telephone Tolls.

The Controller Company registers as a trade mark for the above class of apparatus, the word "Collectophone."

763,351—G. Babcock, assignor to the Stromberg-Carlson Telephone Company. Selective Signaling System.

This is a step-by-step selective signaling device for many-party lines. Heretofore, Mr. Babcock says, difficulty has been experienced in maintaining such selective apparatus in working order, and it has often given poor satisfaction because of frequent mistakes in calling the proper subscriber and because of the undue length of time required for operation, also because of cross-talk, inductive noises, and the liability to interference or "listening in." It is stated that it is not desirable to provide for the accommodation of more than thirty or forty subscribers. I should think not.

The objects of the present invention are to do away with cross-talk and inductive effects, to utilize pulsating current automatically controlled at central for selecting, and to provide for synchronizing.

Each substation is equipped with switching apparatus, all switches moving in synchronism when pulsations of current are sent out from central. A metallic circuit is employed, and automatic mechanism is used at central to control the pulses, this mechanism and working in synchronism with all the substation switches. Each switch makes one step for each pulsation, and after a given number of steps the switch at the corresponding station will come on a contact. This closes circuit through an electromagnet which cuts in the telephone apparatus at that station. In case the switches get out of step, and at the close of a communication, all switches are returned to zero. A target busy signal is provided at each substation, which indicates when the line is in use, and at such times all but the one instrument are locked out.

Polarized magnets similar to ringer magnets are employed for the switches, and the drawings in the patent show that the apparatus has been excellently well worked out. I regret that space forbids my giving a detailed statement of the mechanism, but I shall be glad to obtain a copy of the patent for anyone who desires to read it.

The automatic control is effected through a selective instrument connected with the cord circuit, this being shown at *A* in the drawing. In selecting any given number the operator first inserts a pin in the proper hole in the rim of the instrument, then turns the crank *86* and lets go, first breaking the cord circuit connection at the ringing key *140*. Between impulses the line is short circuited at central for the purpose of clearing it of static charges.

763,374—W. N. Davis. Telephone System.

This patent is assigned to the Stromberg-Carlson Company, and covers a common battery telephone exchange system in which a test relay is employed. In most systems of this kind, as everyone knows, it has been customary to provide duplicate main batteries, and Mr. Davis employs the idle battery for testing.

The general features of the system shown are standard, comprising the usual substation apparatus and the central office line signal relays controlled by cut-off jacks. The test rings of the jacks are normally disconnected from anything, but when a plug is in any line jack all the rings of that jack are thereby connected to the negative pole of the idle battery *14*. The positive pole is connected through resistance *48* and the test relay *46* to the point *47* and through the ringing key by wire *27* to the tip of the testing plug *26*. When this is touched to a jack thimble of a busy line the relay *46* pulls up its armature *45* and closes circuit through the winding *44* of the operator's induction coil, causing a click in the head telephone *C*.

The switch *12* is the usual double pole double throw switch which connects the batteries *13* and *14* alternately to line, the idle battery being charged and at the same time used for testing as described.

763,404—W. Kaisling. Switchboard Apparatus.

The invention in this case relates to lamp jacks for switchboards. Such jacks are usually made in strips of ten, similar to jack strips for line connections, and they are often associated with the line jack strips. Mr. Kaisling shows a lamp strip and a line jack strip combined in one. Each lamp is usually provided with a pair of springs between which it is held in the jack. The individual springs on one side or connected to the respective relay contacts, and all the springs on the other side are usually connected together by a common return wire leading to battery. The principal feature of invention in the present case is the formation of all of these connected springs on one side into one long plate having spring teeth like a comb. It seems odd that no one has thought of this before, for the whole plate can be punched out and its spring teeth formed at one operation, and only one wire connection is to be made with the plate.

In the figure herewith, which is a section taken transversely of a double strip, *3* is a line jack having springs *4-5*, while *15* is the lamp jack, having the usual jewel or bullseye *12* in the front end, the individual spring *18* for each lamp, and the common return plate *24* for all the lamps, extending along the length of the entire strip and having a raised spring tooth *27* in line with the contact of each lamp. Connection is made to the plate *24* with the battery wire by means of a single tail brought out at any convenient point.

763,412—F. A. Lundquist and J. and C. J. Erickson. Automatic Electrical Exchange.

The invention in this case relates to an automatic telephone exchange which seems to be quite completely worked out and is possessed of some quite distinctive features. I regret that it will be impossible to give more than a bare outline here, the system requiring ten sheets of drawings with twenty-two figures and fifteen thousand words of specification for its full disclosure in the patent. The latter was issued to the assignees, who are the inventors with John Anderson of Salina, Kansas, and the Globe Automatic Telephone Company of Chicago.

It goes without saying that the vital features in a telephone exchange system are only two, viz., the switch which is multiplied many times over to form the exchange apparatus, and the circuit appertaining thereto. There are so many circuits having at least their main features in common and their details fairly worked out, that the main desideratum in going into the automatic business is a switch. In fact it is the mechanical parts in the automatic system that have been most subject to criticism, and it is therefore with interest that we perceive here the development of a distinctive type of selective switch. One object of the invention is also the improvement of the substation controlling apparatus and the reduction of the number of wires from each substation to central to a metallic pair with ground.

The operating parts of the exchange switch are mounted on a metal base plate, which in turn is mounted upon a backboard. Connections are made between the operator's instrument and other instruments in the system by connecting the operator's (or calling subscriber's) exchange switch with those of the other different instruments. For instance, if a subscriber desired to call No. 20 he would work his exchange switch to get on a wire connected to the exchange switch of telephone No. 20. It will be understood that provision must be made at each exchange switch for making connections with all the other exchange switches in the system. To this end each exchange switch is provided with a switchboard consisting of two non-conducting plates, arranged one above the other in a horizontal position and in proximity to each other, each of which carries a number of contact points, the points of the two plates being arranged opposite each other on the inner surfaces of the plates. To provide increased capacity, a "compound" switchboard is used, that is, each switchboard is composed of a plurality of series of contact points arranged in squares, there being preferably one hundred contact points in each square, and a separate contact making device is provided for each square or series of contact points on the switchboard. In connection with this apparatus selective switch mechanism is provided by which the circuit may be closed through either of said contact making devices, so that a limited movement only of the different contact making devices is necessary in order to make connection with any contact point on the switchboard as a whole. Another feature of the present invention of considerable importance is this selective switch which picks out the group contact makers. The inventors claim broadly the circuit closing devices arranged between the horizontal plates to which I have referred and movable into contact with points upon either plate. They also claim the grouped contact points a carrier a number of independent circuit closing devices on the carrier adapted to engage the different groups, and a means for making connection between the points of any desired group and the co-operating circuit closing device without touching or cutting in any other groups. The carrier is moved by magnets in different directions (two are sufficient), a contact making device is provided for each group, a selecting arm makes connection with any one of the contact makers, and a separate magnet controls said arm.

In order to provide means for private conversation each exchange switch is connected by two wires to each of the other switches in the system, these two wires from any one switch being connected to two opposite upper and lower contact points, and any subscriber can so energize a controlling magnet to connect himself at will with either of said two contact points, and thereby cut himself off from possible interference or listening in by subscribers who may call him. In the arrangement illustrated the squares or contact points in the forward row of the upper switchboard-plate are connected to what may be called the "general" wires—that is, the wires which do not afford exclusive connection with other exchange switches—while the contact points in the opposite lower row furnish means for securing private connection with the same exchange switches. The contact points at the rear edge of the switchboard are oppositely arranged, the lower row of contact point squares being general and the upper private.

763,464—A. B. Chance. Circuit Closing Device.

Mr. Chance comes from Centralia, Missouri, and his invention relates to a switch-hook which it seems has to be jiggled up and down to do any calling. The contact spring carries a tilted cam, and the switch-hook carries another similar cam, both these cams being insulated on their outer sides. When the hook rises its cam or pin rides up on the insulated side of the spring cam and does not close the circuit. When it comes down it rides on the metal side, and does close the circuit. What good this does I am unable to perceive, but it probably fits some peculiar circuit that the gentleman has in mind.

763,501—A. J. Mundy and A. E. Smith. Electric Transmitter.

This is a carbon telephone transmitter intended to be let down in a body of water to respond to vibrations or signals transmitted through the water. The device looks like a resistance button cut bodily out of a solid back transmitter, and provided with broken up carbon filaments instead of granular carbon between the electrodes, which are grooved in their opposed faces to hold the filaments. This is reminiscent of the old Clamond and other so-called multiple electrode transmitters.

Specifically stated, a brass ring has two mica diaphragms, one on each side, clamped on by threaded collars. Each diaphragm carries an electrode inside, and between the

electrodes are the pieces of carbon referred to as filaments. Mr. Mundy comes from Boston and Mr. Smith from Waltham, Massachusetts. The patent is assigned to the Submarine Signal Company of Waterville, Maine.

763,575—C. H. Viggars. Sound Collecting and Magnifying Device.

This is a telephone apparatus for the desk, and comprises a microphone transmitter and a battery in a tubular casing, one end of the casing being fitted with a sort of megaphone sound collector and directing sound into the transmitter mouth piece. A watch case receiver has a flexible cord connected to it terminating in an ordinary switchboard plug, and a spring jack to fit the plug is fitted within the tubular casing between the microphone and the battery. To use the apparatus the plug is put in the jack and this automatically closes the transmitter circuit to the battery. The receiver being held to the ear, sounds are collected by the megaphone and magnified by the microphone. When the plug is withdrawn the circuits are broken. Mr. Viggars is from Milton, Mass., and the patent is assigned to Charles Bate of Brockville, Canada.

763,755—J. G. Holmstrom. Combined Telephone Receiver and Transmitter.

It has often been proposed, particularly abroad, to combine the transmitter and receiver into one instrument in the same casing. One great objection has always existed to such a procedure, however, even if desirable from other standpoints, i. e., that the combination will get started on the same pitch, usually the pitch of one or the other diaphragm or a mean of the two if they approximate, and a good howler will result. As the vibrations are propagated through the casing as well as through the air it would be necessary to insulate in pretty general fashion to stop this trouble. No one has considered it worth the trouble to try, apparently, until Mr. Holmstrom, who hails from Stockholm, Sweden, conceived the present scheme. He makes a partition between the two instruments out of paraffine or wax, and insulates the two halfs of the casing from each other by inserting a rubber gasket between them and bushing the screws that secure them together. A microphone and a receiver can be put back to back in one shell by this method without interference.

763,803—C. E. Scribner. Signaling System for Telephone Exchanges.

This is a system employing local batteries at the substations for talking and central battery for signaling, current for the latter flowing over the lines only temporarily. A target signal for each line is provided at central, which pulls up when the circuit is momentarily closed at the substation in the rising of the switch-hook, the battery and signal being then short-circuited so that the latter remains displayed. When a plug is inserted the short local circuit is broken, and the signal is retracted. A clearing-out signal of the same type is connected with the cord, the battery being in bridge thereof.

In the diagram herewith *A* and *B* are two subscribers' stations. At each a relay *f* is included in one side of the line and is adapted to short-circuit the line when energized. The switch-hook is adapted to ground the relay side of line at the contact *e'* in rising and falling. The battery *b* at central is grounded, hence when the hook rises a wave of current passes from ground and battery to and through the signal magnet *c*, through the line wire *2* and and relay *f* to ground. When the armature of magnet *c* is pulled up it closes a local circuit *3* through the jack, which holds it up. When plug *g* is inserted the circuit *3* is opened in the jack and the signal retracted. In ringing the key *k* is depressed and is held down by the latch *m3*. Ringing current from generator *G* then goes both ways to line, through the magnet *m*, but does not effectively energize the latter. When the subscriber answers his hook momentarily closes and grounds the line *2*, whereupon magnet *m* gets current from battery *b* to energize it, displaying its signaling and releasing the key. This makes a momentary break and de-energizes both magnets. At the close of the communication, when the subscribers hang up, the line *2* is grounded in each case, magnet *m* pulls up and shows its signal, relays *x f* pull up and hold up, and the circuit is finally broken by pulling out the plugs.

Provision is made for recalling the operator by jiggling the hook, as in all central energy systems, by putting a short circuit *8* around the relays *f*. In one direction this is made and in the other it is not.

763,911—J. W. Lattig and C. L. Goodrum. Call Register for Telephone Systems.

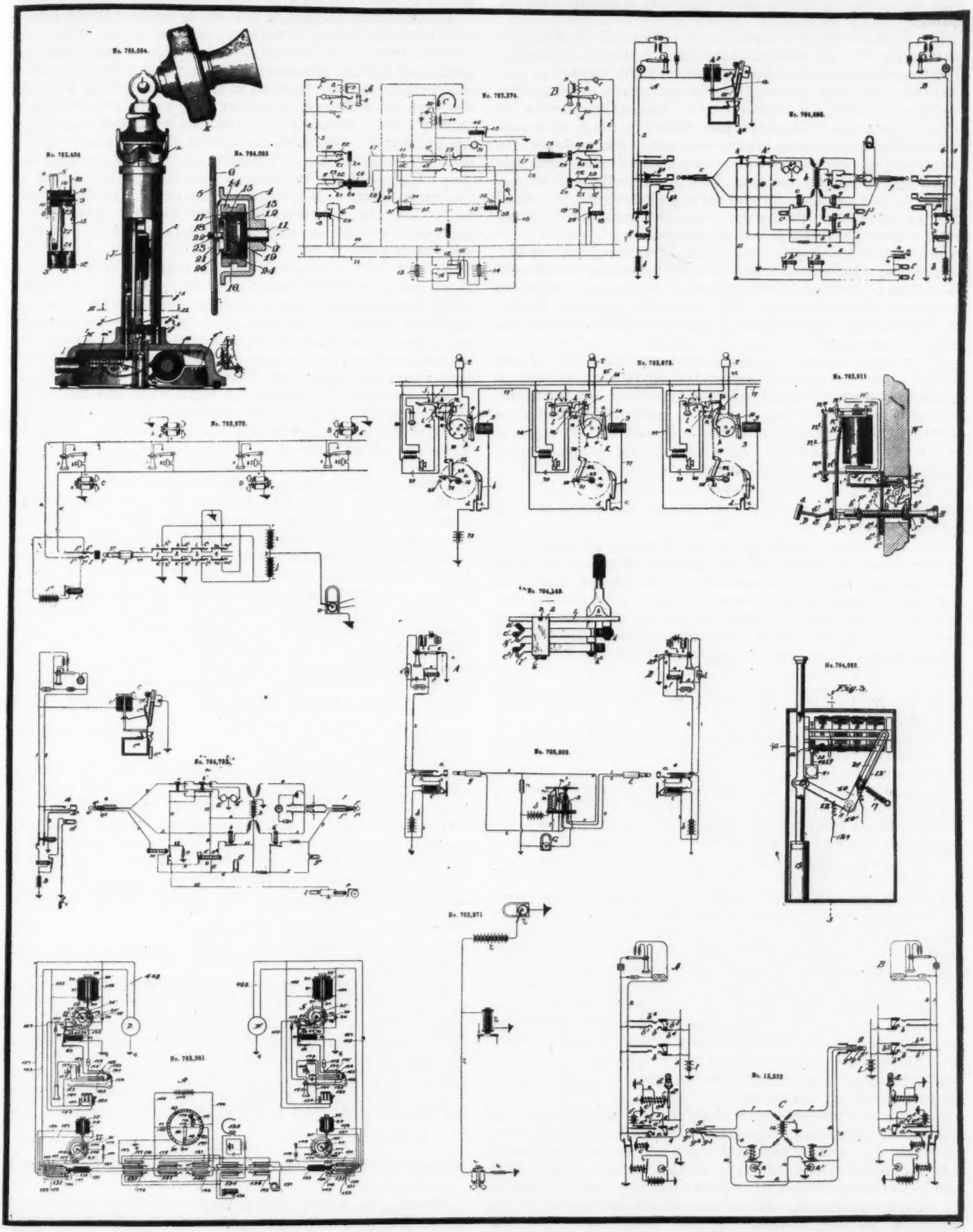
This is a call register fitted to the door of a box located on the upper part of the backboard of a telephone. All the parts are mounted on the inside of the door, which is shown in section in the figure herewith. The idea is to register each call by pushing a button, which is normally locked so it cannot be tampered with. If the operator can get the desired connection she puts proper current to line to unlock the register, and tells the calling subscriber to push the button. He does so, the first movement cutting in the unlocking magnet, the continued movement registering, and the final movement ringing a gong which the operator can hear.

A cyclometer register *R* is used, being set in the thickness of the door. *B* is the push button, with an arm *b3* to work the register. The arm also carries a pin *b2* sliding in a slot *p4* in guide plates, and also serving to rub against an inclined plane or cam on the rod of the hammer *D*. The button spindle is prevented from moving very far by the locking bar *n7* which lies in its path. It can move far enough, however, for the pin *b2* to touch the hammer cam and thereby close circuit from line through the unlocking magnet *N*. If the right direction of current is on line this magnet, which is polarized, swings over the lever *n6-n7*, and the button goes all the way in, working the register and throwing up the hammer *D* to strike a gong fastened inside the box.

763,970—T. C. Drake. Party line telephone system.

The conception in this case is simple but very interesting, by reason of the slight character of the means employed to attain an important end. The true designer (that is, he with the true instinct) never complicates either mechanism or circuits, but on the contrary imitates in a mental sense the Japanese wrestling game of jiu-jiutsu, which physically demonstrates that if you yield at opportune moments you may turn your adversary's force to your own end and advantage. In that game the inexperienced wrestler may make some strong effort only to find his adversary limp or absent, and his force expended in fearful racking effects on his own frame. This is a fair parallel to the self-reacting efforts of many inventors and designers, who attack a problem intent upon solving it by what Max O'Rell has termed "sheer brute force of intellect," and who often expend efforts out of all proportion to the results obtained. Thus in the old days the recoil of a heavy gun was taken up by a solid breeching or abutment, now it is stored up in a spring or in compressed air and runs the gun out again and particularly in the case of small arms reloads the gun. Every once in a while we see an instance of subtle appreciation of the harmony of natural forces, and a design in which they seem to be perfectly dove-tailed.

All of which is merely another way of saying that Mr. Drake has a very pretty scheme. Whether it is practically applicable is a matter for experimental demonstration. Party line ringers have heretofore been biased by means of small springs, and the adjustment of these springs has had to be



quite accurate. Each bell would respond to pulsating of one sign only, current of the other sign only working with the spring.

Mr. Drake turns his ringer up on edge so that the weight of the clapper will bias the armature one way or the other. Then in order to make sure of restoring the clapper to this position after each stroke (this being usually done by the spring) he uses alternating current having pulsations of unequal strength. Thus the plus bells are rung with current having strong plus waves and weak minus waves, the latter serving merely to restore the clapper each time, assisted by the weight thereof. The minus bells will not respond to this current, for the strong plus waves only hold their clappers down the harder, while the weak minus waves are not strong enough to lift the clappers up.

In order to obtain this unbalanced alternating current Mr. Drake puts a battery in series with his generator, which will of course strengthen those pulsations with whose direction it agrees, but will weaken those which it opposes. In the one case there is an addition of electromotive forces, in the other a subtraction.

In order to reverse the unbalanced condition, Mr. Drake provides two batteries oppositely connected, either one of which may be put in series with the generator. In the figure herewith these are shown at *i* and *j*, both permanently connected to the generator *x*, which will send out strong plus and weak minus, or weak plus and strong minus current waves, according to which battery it is connected through.

763,971—T. C. Drake. Ringer system for telephone exchanges.

The invention in this case is quite feeble, although it is elaborated to the extent of two sheets of drawing and over five thousand words of specification. It consists simply in putting a battery in series with a ringing generator so that the battery current will hold up the cut-off relay *c3* and prevent its armature from chattering. This is intended of course primarily for the Kellogg common battery circuit.

763,972—J. T. Fisk. Automatic selecting apparatus and system.

Here is another heavily built case requiring seven sheets of drawing and thirteen thousand words of specification for its presentation in full. In these cases attorneys and all those who have to do with the cases should certainly receive a goodly rate per thousand for their travail.

Mr. Fisk is from Adrian, Michigan, and the patent is assigned to George P. Fisher, Jr., of Chicago, as trustee.

The invention herein is a complicated and delicate piece of mechanism. I really do not know whether there is demand enough for a selective apparatus that will permit thirty or forty stations to be used on one line, to justify the recent outpouring of similar patented devices. The mechanism is well designed enough, and involves some very clever ideas, such as the so-called "hit-and-miss" governor, but it seems to me that it would take a first-class mechanic to keep thirty or forty of these in order, so that taking into consideration their first cost and his wages, beside the added element of depreciation thus introduced, such a system would be more expensive in the long run than one employing more wires and less apparatus, or than one having more lines and a small switchboard somewhere.

I have not attempted to illustrate the mechanism. At each station there is a dial selector which has a circular series of holes, in one of which you put a pin to call that party, and a crank that you then turn around to wind it up. This sends a suitable number of impulses and steps around wheels at all the stations on which there are the usual pins set at different angular distances around from zero. All the wheels have zero pins in the same position normally resting against fixed stops. When any one wheel is set by the right number of impulses, it closes the local ringer circuit, which includes the local talking battery.

The cleverest scheme in the whole system is the release device to let the step wheels go back to zero. This comprises a tripping lever having a foot that engages the stop pawl, and having a hook-ended finger overlying the end of the armature lever. In front of the armature lever is a little dog or bell-crank lever, which as long as the armature is vibrating rapidly to step around the switch wheel is kept kicked up and by its repeated blows keeps the hook-lever kicked up. When the armature finally stops and falls back the dog drops inert and the hook-lever settles over the end of the armature lever. One more attraction of the latter then pulls over the trip lever and lifts the stop pawl out of engagement with the teeth of the wheel, which thereupon returns to zero.

At each station is a lock-out comprising a lever *n* which is moved by a spring into the position shown in station *2* in the figure herewith as soon as the wheels start. As long as all the wheels are at zero the zero pins keep these locking levers shoved over as shown at station *3*. At any station selected its pin *p* shoves over the lever and at the same time closes the bell circuit there through.

The signaling is done over a third wire, and the talking over a metallic circuit upon which the instruments can be bridged by the switch-hooks, except when the latter are locked as already stated.

764,055—D. C. Jackson. Telephone transmitter.

This is Prof. Dugald C. Jackson, who has been taking a good deal of interest lately in telephone matters. The present invention is a granular transmitter of the solid-back type comprising the usual front and back electrodes, the former carried on the diaphragm by a short stem, and the latter in a bridge. Around them is a heavy metal ring casing into which the rear electrode button screws. A distance ring lined with paper is screwed in on top of this, and on top of this again is a ring *17*, faced with felt *18*. The front electrode works like a piston through this felt ring, which is exceedingly reminiscent. The chamber in the ring between the electrodes is shown entirely filled with granular carbon.

764,139—J. W. Mead, H. A. Mackie and Martin VanBuren. Telephone.

This is a substation circuit having the usual transmitter, receiver, ringer, induction coil, switch-hook, and local battery. There is no magneto generator, a second induction coil with a buzzer on it being provided, having its primary included in circuit with the local battery and controlled by contacts worked by the switch-hook in going up or down, so that at such times momentary induced impulses are sent to central to throw down the drop for line signal or clearing out.

764,143—W. E. McCormick. Circuit changer for telephone switchboards.

This is Mr. McCormick of Chicago, the patent being assigned to the International Telephone Manufacturing Company of that city. The invention is a ringing and listening key having a plate carrying an insulating support with all the springs mounted in it at one end, as shown at *2* in the figure herewith, while the key lever is mounted at the other end of the plate, the springs extending horizontally along the plate to have their ends engaged by the insulating buttons *k2 and k3*.

764,690—E. H. Smythe. Apparatus for telephone switchboards.

Mr. Smythe works for the Western Electric Company, to whom this patent belongs. A standard Bell relay switchboard circuit is shown, with some modification to fit it for use with a toll collector box at the subscriber's station, of

the type that gives back the coin if the desired connection cannot be obtained. In such systems, Mr. Smythe says, the careless operators often give back a man's money when they should not, "or vice versa." This is a strikingly artless statement, and savors strongly of officialism. My personal experience has been that when an operator gets gay she not only takes all the money that is properly coming to her, but keeps what ought to be returned. It would be a piece of charitable redundancy to add "or vice versa." I recall a quite recent instance of wasting $1.25 worth of time trying to persuade an operator in Chicago to come back on the line and give me my nickel, which she had willfully and feloniously purloined with malice prepense, in which offense I have no doubt she was aided and abetted by her company, its officers, agents, servants and employes. A single instance of this kind, contrary to the general rule, is more than sufficient to generalize from.

However, be it to save the company, or be it to spare the subscriber, Mr. Smythe provides a pair of lamps, one connected to a back contact on each of the cord keys used by the operator, *h* to throw the nickel into the box, and *h* to throw it out. Each lamp is connected on one side to one contact, and by common return to the battery, this common return being shifted to one key or the other by a relay *i* controlled by the supervisory relay of the calling plug.

Suppose the test shows line busy; then the relay *i* leaves its armature back, cutting the battery wire *3* onto the key *h*, which is the retaining key for coins. The other key may then be pressed without any more shocking result than to give back to the subscriber his coin. If by accident or design, however, the key *h* is pressed, to put the coin into the box, the lamp *l* will light, and stay lighted because of the locking relay *k* which stays up after being once pulled up.

If a subscriber has been called and answers, the relay *i* is energized through the agency of the supervisory relay *g* and cuts current on to the key *h'*. *h* is the key then to be pressed, and if by accident or design the other is depressed, the lamp *l'* will light, announcing with a baleful glare that the company's treasury has been robbed.

These lamps *l* and *l'* are supposed to be located in front of a supervising operator. I have no doubt the system will work, but I perceive here an opening for some genius, that is, I mean some other genius. Let him devise an automatic signal that will scream a loud alarm when the supervising operator's virtue fails to work, and she winks at robbery.

764,752—F. R. McBerty. Apparatus for telephone switchboards.

This is another system of the same kind as Mr. Smythe's, but in this case it is intended to prevent the operator from pulling out the plug without actuating one of the keys at least. Mr. McBerty is liberal and does not limit it to one or the other. This is accomplished in the following manner, the circuits being again the well-known Bell standard relay circuits: When the answering plug *e* is inserted, the circuit *6-3* is closed and the magnet *m* closes the local circuit *12-9-8* to battery. The magnet *O* being pulled up stays pulled up, and if the plugs are pulled out without working one of the keys *k-k'*, the magnet *m* will make the circuit *9-10* and its armature before it breaks the circuit *9-12*. When this is done the signal lamp *l* lights and the register *p* counts one.

764,792—J. L. Bolan. Automatic electric light for telephone booths.

This is one of those schemes where a circuit closer is caught on the clapper rod of the ringer, and when the bell rings the circuit closer closes, in this case to light a lamp in the booth.

764,963—H. D. Stroud. Toll register for telephones and an electrical system for controlling the same.

This patent is assigned to the National Measured Service Company of Chicago. Mr. Stroud is with the Controller Company of America, and is very well known in connection with coin-controlled apparatus and toll systems generally. In the present case a register is shown having members that are set forward step by step, number teeth being provided thereon so that the number can be signaled to central by an arm sweeping across the members at any time. The idea here is to provide means for the operator to count back or take off the call registered in case the wanted subscriber cannot be obtained, it being impossible for her to work in collusion with the subscriber, however. A magnet works a pawl that controls the units disc of the register, and as the subscriber calls he sets this units disc forward one step and sets the pawl in so doing; but if the operator fails to get the subscriber wanted she sends a current impulse through the magnet to set back the disc. The mechanism remains in the position to which it is thus brought until the subscriber makes another call, so that only one step either way is possible at once, this serving to prevent collusive working. In registering, I should say, the subscriber has to press a button, although to call central he has only to remove his receiver from the hook.

765,064.—P. C. Burns. Telephone desk set.

This desk set hardly needs description, especially in view of the figure herewith, as it will be recognized at once by all telephone men. It is the standard type with removable pillar and transmitter, manufactured by the American Electric Telephone Company, of which Mr. Burns is president. The induction coil is in the base, the switchhook is mounted on the strip *J*, which extends up through the vertical pillar and serves to bind the parts of the instrument together, and the circuit of the transmitter is completed automatically when the instrument is assembled by means of the two points *j-j2*, which extend down through the top of the base into the chamber therein, where they make contact with the ends of the spring *m4*. In addition to the transmitter circuit the circuit of the switchhook is made through points and springs if desired, only one additional point being usually required, as the frame may serve as a common return.

765,142—Isidor Kitsee. Telephony.

Dr. Kitsee has been living in Philadelphia for some time, and is understood to be in rather poor health. He still manages to turn out an invention every little while, however, the present one being an improvement on one for which the patent was recently digested herein. Dr. Kitsee's claims are usually of much more importance than any of the apparatus he shows. In the present case he describes a common battery switchboard, or one intended to operate as such, in which he has line terminals of the type in the previous patent referred to above, plugs for the terminals, movable contacts in proximity to the plugs as regards parts thereof, and means to prevent more than a single plug from engaging one of the contacts at the same time.

The patent is hardly worth reading.

Interesting comparisons of English and American telephone systems have been made and show London to be a long way behind New York. In the latter city an area of 429 square miles, with a population of 4,000,000, as against London's 640 square miles, with a population of 6,500,000, is covered by no less than 200,000 wires, while New York, including 15,000 postoffice lines, can boast of 80,000. Despite this big difference and the fact that London pays a proportionately heavier rate, the service there leaves much to be desired, and as regards efficiency it certainly is not to be compared with New York.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

Independent Telephony at the World's Fair.—Telephony, June.

FINANCIAL AND ECONOMIC.

The telephone was first exhibited at the Centennial Exposition in 1876. Long distance lines were first publicly exhibited at the Columbian Exposition in 1893. The first great exhibit of Independent telephony is at the Louisiana Purchase Exposition this year, and will represent the greatest modern thing influencing the life of the great community.

German Federal Telephone System.—Electrical Age, May.

A memorandum of statistics furnished by United States Consul General Guenther, Frankfort, Germany. The longest telephone connection in Germany is between Berlin and Paris, 742 miles. Sixty-five messages per day take place between Berlin and Paris.

Independent Long Distance Service—BARRY.—*Telephony, July.*

It is believed that the numerous detached Independent telephone systems will soon be interconnected by a long-distance system under a single general control, whether or not the financial interests now involved coalesce. It is stated that the headquarters of the new organization will be in Chicago.

Independent Telephony in Ohio.—Finance, July 2.

The Independent situation in Ohio has recently been strengthened by the granting of a franchise for a large system in Cincinnati. The completion of this plant will increase the revenue of every Independent telephone company in the state, and will greatly strengthen the Independent long-distance situation in all that region. A committee is at work preparing plans for the consolidation, or at least for arrangements for the co-operation, of the Independent long-distance companies of the United States, and within five years nearly every city in the United States will be reached by Independent long-distance service. A striking feature of difference between the telephone business and other industrial activities is that a financial depression affects the telephone business less than most others. This has been proven to be true in Ohio during the past year, and was proven more fully during the depression of 1893 and 1894.

Ghost Stories.—Finance, July 16.

The Independent movement is becoming stronger year by year, and in Ohio there are more stockholders in Independent companies than there are Bell telephones. The newspaper articles to the effect that the Bell company is about to raise twenty million dollars to drive competition from the field is absurd, because, if it were possible at all to buy up the Independent plants, it would take many times that sum to do it. Figures which have been published in eastern papers in reference to the telephone development of New England states are entirely misleading, as is shown by the comparison given in this article. There is no community in the United States where the demand for telephone service is not growing. This is true as well of the demand for gas, electric light and traction service, but the rate of growth and the rate of development is greater in the telephone business than any field in the other industries. Strong organization, properties in good condition, equitable rates, and the consolidation of long-distance companies will solve the Independent telephone problem. Until recently it has been contended that the Independent interests could not occupy the large cities. There seems to be no reason why this contention can be maintained any longer.

European Telephone Development.—Telephone Journal, June 25.

For some reasons which do not immediately appear, the general design of telephone apparatus in Europe differs from that which has been followed in the United States. Further, there is a distinctly wide variance of design in the various countries of Europe, and in some of those countries the density of telephone development and the character of telephone methods are quite out of proportion to the social and industrial activities in general. In Germany there has been produced an arrangement of switchboard apparatus for small exchanges, in which there are no cords, and in which the connections are made by means of keys, each line being provided with one.

Never Three Telephone Interests.—Finance, July 16.

One of the strong features of the Independent situation is the fact that telephone men are agreeing that there should be no competition among themselves. If an Independent company properly develops its field, it is to be the policy of the others not to infringe upon its territory. There are ways of perfecting this plan, and an agreement to refuse to give a third company a long-distance connection is recommended as a solution of the problem.

Telephonic and Telegraphic Applications in Japan.—l'Ettricita, Milan, June 17.

It is a general opinion that the degree of civilization of a nation may be judged by the development of its means of communication. In Japan we have an excellent confirmation of this method of judging. In the last twenty-five years that empire has built up a system of telegraphs and telephones which is as extensive and highly perfected as that in any of the European states. The complete development of the telephone system is of more recent date and rapid growth than that of the telegraph in Japan. The government owns both, and the figures in the article of the extent of development in 1901 are largely exceeded now. It is noted as of interest that interurban line development preceded that of exchanges. The Italian author calls the whole matter admirable, remarkable and astonishing.

The Telephone.—TAYLOR.—*Sound Waves, July.*

EQUIPMENT.

The seventh of a series. This installment describes hook switches, illustrating the construction differences between hooks for series bells and those for bridging bells. The things to be watched in maintaining hook switches are the adjustment of the springs, and their proper action in making contacts when the hook is down, and breaking them when it is up. As to batteries, dry cells are superior to wet cells for transmitter current supply. The advantage of securing good dry batteries is well recognized, but the method of testing is not generally understood. The described method is to arrange a clock with contacts closing a circuit for five minutes in each twenty minutes, thus making three periods of contact in each hour. The making of this contact energizes as many relays as there are cells to be tested, and the closing of each relay contact puts the resistance in series with the cell under that contact's control. Voltage and current readings taken at regular intervals enable the watt-hours to be figured at the end of the run. When the cost of the cell is taken into account in connection with the results of the test, the cost per watt-hour may be figured and this will enable the cell to be compared with others which have been tested. The author gives a table of tests on twenty cells; the cost per watt-hour varies from about 36 cents to about $2.03, so that it is easy to see that the cell which gave

the result first mentioned is better for telephone purposes so far as the cost of the energy is concerned. It happened that this most economical cell gave a large result in watt-hours, and cost about an average price. Some suggestions with reference to wet batteries close the article.

Plus-and-Minus Selective Signaling.—Western Electrician, July 2.

In an answer to a query from a reader, the operation of biased polarized ringers is described, and an attempt is made to point out the reason why certain stations can be rung with less success than others, when in a central energy system the line relay and main battery in series are permanently bridged across the line. The suggested remedy is to insert a resistance in the main ground of the central office battery.

Telephone System of Hotel Monterey.—AYLSWORTH.—*Journal of Eelectricity, Power and Gas, June.*

A description with circuits of the combined hotel annunciator and switchboard system of the hotel in question.

Two-Way Trunk Circuit.—GEMMILL.—*Telephone Journal, June 18.*

The circuit described is suggested for use with a common battery system having jack sleeves grounded through a high resistance cut-off relay, and is intended to operate as a call-circuit trunk with all the advantages of a one-way system, but with the additional advantage of being capable of operation in both directions. The circuit can be used with economy between offices having a smaller trunk traffic than would warrant the establishment of two complete systems of trunks of the one-way type. Considering the described system from one of the offices, it is found that each trunk is equipped with outgoing trunk jacks, multiplied before the subscribers' operators, and which are to be used in quite the same way as if the trunk were two-way. The trunk is also found to be equipped with a plug at the incoming trunk position. Such provision is made as will guard the trunk against being assigned by the trunk operator at its incoming end when it is in use for outgoing purposes, and with the regular disconnect and guard signals incident to regular trunk working. For every group of such trunks between any two offices there is required a call circuit in each direction, one leading from the group of subscribers' operators to the distant trunk operator, and the other similarly arranged, but in the opposite direction.

Indicating Fuse Alarm.—BUNDESMAN.—*Telephone Journal, July 2.*

In central energy exchanges, the carrying of current from the storage battery to the various parts of the central office apparatus, requires small fuses to protect the wiring and apparatus from damage if excessive currents should flow as a result of faults. An ordinary fuse may operate and that fact remain unknown until a subscriber complains. If the fuse is specially designed, however, it may display or sound a signal when it operates, and such an arrangement as that is described in this article, and illustrated in a drawing.

Toll Timing Apparatus.—MANSON, LIBBEY AND SIMPSON.—*Telephone Journal, July 9.*

Various methods are used in telephone exchanges for timing long-distance conversations. Commonest is the ordinary clock. Next most reliable and accurate is the time stamp. The disadvantage of the clock is that, however well it may be keeping time, the time does not seem the same to different operators because of the defect of parallax, or seeing under the hand of the clock, which must be some little distance from the dial. Of the total errors made in this way it seems probable that the greater number are against the telephone company, because of the personal bias of the operator in the direction of avoiding complaints from the patrons. Time stamps are of many sorts and some of them are particularly arranged to compute the time elapsing between first and second impressions, and this article, which is the eighteenth installment of a series on telephone exchange engineering, describes in detail the form of tuning mechanism which is most generally used in telephone work.

New Exchange in Buda-Pest, Hungary.—HOLLOS.—*World & Engineer, July 16.*

A new equipment has been installed in this city, the central battery system being adopted. The ultimate capacity of the exchange is 40,000 lines, consisting of two switchboards of equal capacity, one of which is installed to a present size of 10,000 lines. The character of the building is somewhat striking, the operating room being, after the manner of other European offices, very commodious and very ornate. In general, the equipment installed is similar to that used by the Bell company in this country.

New Holborn Telephone Exchange'—London Electrical Review, July 1.

The new equipment of the National Telephone Company in the Holborn office, London, is described in some mechanical detail with seven excellent half tones and one line drawing. Features not covered in the *Electrician's* description appear in this article, but they have to do mostly with details of this office in particular, rather than with improvements in the general system. The London *Electrical Engineer* of June gives still other circuits in its description of this installation. The drawings which accompany the article in this periodical show the details of the meter systems, interesting as representing all that is done in meter work in the large cities of this country, as well as the feature of making charges at different rates with a single meter per line.

New Holborn Telephone Exchange.—London Electrician, June 10.

The National Telephone Company is continuing its policy of improving its facilities for giving its part of the telephone service of the city of London. One more of its fifty-seven exchanges in the metropolitan area has been converted to the central battery system and in this instance the central office has been moved nearly one-half a mile. Five thousand four hundred and forty-three substations are connected into the Holborn office and of this number 4,600 are individual lines. Seven hundred and ninety-two trunk (or junction) lines are required, as but 18 per cent of the calls are local and possible to be connected into the multiple of the office. The ultimate capacity in lines of this switchboard is 8,700. The floor plans accompanying the *Electrician's* description of the Holborn office are interesting because of the arrangement of apparatus, because important dimensions and the scale are given, and because the building is of peculiar shape. An interesting feature of the equipment is the evidence of large provisions for supervisors, monitors and inquiry clerks. The general character of the Holborn equipment is that of the central battery system used in the United States, but ingenious features are applied which are not generally adopted here. Inasmuch as the service is largely on the message rate system, a complete equipment of subscribers' line meters exists, the method of operation being that in which the operator presses the meter key at the proper stage of the connection. Because the rates of charge for the regular London district is different from that of outer London, the call circuit or junction line order circuit are provided with such extra contacts and circuits as cause a red lamp to light whenever a call is made for a station in the outer and higher priced district. This reminds the operator that she must press twice on the meter key instead of once, and in the end of things the subscriber will be charged two pence for such a call rather than one penny, although it will appear in his bill that he had made two one penny calls. Another interesting feature of the equipment is that when it is desired by the chief operator or other supervising person to give certain information to the operators, perhaps needed by only one of them, the person sending the information may go in on an instruction circuit, lighting a green lamp before each operator. Each operator then shall press a key associated with the lamp, and getting the information releases the key after which the lamp burns no longer. A case of improper disconnection or other subject matter can thus be handled in a manner not possible by having the supervisor

visit the operators in turn. All connections require an effort on the part of the operator to record the call upon the subscriber's meter. If he is on the unlimited service system no bill is rendered but the total number of calls may be known by the operation of the single register per position. An interesting innovation is with reference to night service. In slack hours a subscriber's call lights his line lamp and the line pilot lamp as usual, but in this office at night it lights the usual large incandescent lamp over the position so that to go quickly to the place of a call is an easier matter than usual.

Equipment Notes.—WEGNER.—*Telephony, July.*

Generator wires and circuits should be kept as far as possible from other circuits. Battery circuits to transmitters should be kept free from disturbing influences. In running cables between the office terminals and the cross connecting board, the terminal ends should be formed and fanned out first. In running cables between the cross connecting board and the switchboard, the former ends should be formed first. The battery room should be in a cellar because of the lower and more even temperature, but the location should be cool, dry, easy of access, and not near anything likely to be injured by the acids or acid fumes. Ventilation of the battery room is essential. If it is on the same floor with the power machinery and power board, it should be separated by airtight partitions. Power machines must be on rigid foundations, which may be of concrete or brick, and should be clear all round for ease of access. Power machine covers of moisture proof fabric should be provided and kept over machines when not in use. Where ringing machines are in duplicate, one cover only is necessary as it can be moved from one machine to the other as operation alternates. Wiring of the power plant should be concealed, being run in conduit with special moisture proof insulating joints.

New Microphone.—*Revue D'Electricite, June 25.*

Tariel has designed a new form of transmitter in which the carbon particles are in the form of small pieces of particular shape and dimensions. A number of advantages of the usual sort are claimed, such as great sensitiveness, freedom from arcing, and a suppression of the polarization of the carbon particles.

Strowger Automatic Telephone System.—LUBBERGER.—*Telephony, July.*

The first of a series, and the first popular description of the automatic system most widely used. Five photographs and three circuit drawings show substation and central office equipment. The system has been developed within thirteen years, and has passed through four distinct phases, the last great step being the one necessary to adapt the system to exchanges of the largest size. The description of circuits is interesting in several particulars, notably these: Impulses for operating the central office switch are given by the application of a ground connection at the substation given during the returning motion of the dial. For any figure selected by the subscriber in the successive pulls of the dial, that many impulses are given over one of the wires, and this series for each pull is followed by a single impulse over the other wire; but in an exchange having numbers of four figures, the rotary motions of the switches are automatically accomplished by central office means for the first two pulls of the dial, while the last pull and the next to the last accomplish rotary and vertical stepping in exact obedience to the dial pulling.

The Isophone.—*L'Eclairage Electrique, June 4.*

Sheers of Brussels has invented a new form of carbon transmitter. The carbon granules and their proper and usual electrodes are contained in a pocket or envelope of leather, parchment or other non-resonant material. The vibrations of the diaphragm, which is a trifle unusual in some ways, are transmitted to the pocket through a pointed rod of ivory, hard rubber or other hard material. The absence of direct connection between the carbon and metallic parts of the transmitter is claimed to give much greater and better results. The volume and character of the work of the instrument are praised in high terms.

Electrolysis of Underground Cables.—DOBBS.—*Sound Waves, July.*

LINES AND LINE CONSTRUCTION.

The reason cable sheaths are damaged by electrolysis from currents of street railway systems is because the cable sheath after carrying current for a distance gives it up to the earth, and is corroded in so doing if the current leaves in the presence of moisture. If this moisture has acids or other chemicals dissolved in it, the destruction is much more rapid. If it were possible to prevent currents from flowing in the sheaths, the cables would be safe. There are two ways of preventing the current from flowing. One is the use of a double trolley system of traction, and the other is the complete installation of a system of cable sheaths. As neither of these methods is yet under the control of the telephone companies, some means of preventing the cable damage, while still allowing the current to flow over the sheaths, is necessary; but these means are not reached in this article. Ten statements of electrolytic conditions treat the matter as affecting the subject under study, and a table of resistances and carrying capacities of tracks of different character is offered as assisting calculations with reference to electrolysis.

Cheap Rural Lines.—DOBBS.—*Telephone Magazine, June.*

The whole tenor of this article is that rural lines should not be cheap in quality. The author protests against the use of such loose specifications as call for native poles set far apart, and put in service without due regard to honest construction methods. He advocates good poles of ample top diameter gained for at least one cross arm, properly stayed and guyed, and indicates that no satisfactory pole line can be built for less than from $60 to $100 per mile.

Conduit Construction.—STILLWELL.—*Electrical Age, May.*

In an article entitled "The Development of Electric Power Transmission," to appear later in *Cassier's Magazine*, the author treats underground construction, illustrating in excellent drawings the arrangement of the ducts in runs of different sizes, and the construction of a manhole with a sealing cover.

Cable Boxes and Distributing Hoods.—WILHELM.—*Telephone Journal, June 18.*

Underground cables may be terminated aerially in three ways: In cable boxes on poles provided with cross arms, in terminals on poles equipped with distributing rings, and in terminals on an elevated railroad structure. The author states that a seven ampere fuse should be used to protect the cable against the possible entrance of a high voltage, and describes the method of associating these fuses with the cable conductors at the point of cable termination. Four drawings illustrate the details of such equipment.

Precautions: High Tension and Telephone Lines.—SCOTT.—*Telephone Journal, June 18.*

Five drawings and a description illustrating the methods of protection outlined by Chetwood in the *Electrical World and Engineer*, and digested in the last issue of TELEPHONY. The object of the instructions and drawings is to illustrate good methods of protecting telephone lines against possible contact with circuits carrying power at high potential. A distinctive feature of these methods is the use of heavily grounded steel conductors intended to protect the telephone lines both by their strength and their electrical condition.

Cable Pair Selection.—PRICE.—*Telephone Journal, June 25.*

Four illustrations and a description cover the method of identifying the pairs of wires in a cable. The mechanism involves the use of a tone test produced by a buzzer, and is so arranged that one man may make the tests without other assistance than the tools with which he works.

Lead Covered Cables Attacked by Insects.—*World & Engineer, July 16.*

In Shanghai, China, lead covered cables have suffered from perforations originally assumed to be caused by small rifle bullets. It has lately been established that these holes

are the work of wasps of a species that lays its eggs in living bamboo. These wasps gather around bamboo groves in July and August, to lay their eggs inside of the cane, where they will be well protected from the attacks of enemies. It seems that the instinct of the wasps is such as to cause them to drill through the cable sheaths, and protective measures have had to be applied. So far as observed they do not drill through the sheaths of cables which are covered with a fiber braiding outside the lead. As perforations in cable sheaths have been ascribed to bullets or to lightning discharges almost wholly heretofore, and as certain warm sections of the country have been more subject to such troubles, it has been believed that the lightning theory is well established. The shape of the perforations, however, has caused a doubt to exist in some minds whether the true cause had been found. Also the holes sometimes appear when the conductors in the cable are not injured. It would seem wise to take a new start on these investigations in order that the insect which is causing the trouble in this country, if such is the case, may be discovered and his work interrupted. The article further gives details of the development and equipment of Chinese exchanges.

Alternate-Current Electrolysis.—BROCHET AND PETIT.—*Comptes Rendus, June 6.*

In connection with the very important question, "What will result as to electrolysis of underground cable sheaths when the street railway systems change their power from direct to alternating current?" the experiments of the authors are of interest. The solubility of various metals in certain solutions under the influence of alternating currents of various frequencies has been tested. They found that it is not correct to assume that solubility decreases when the frequency becomes greater. The behaviors of different metals are at variance. The behavior of lead in the presence of sulphuric acid shows a maximum of solubility at about 15 cycles per second, and after that a slight decrease. It is evident that the time is ripe for a considerable and exhaustive study of this new hazard.

Telephone Lines: Distribution.—MCMEEN.—*Telephony, July.*

An installment of a series on telephone lines, this issue dealing with methods of conduit construction, cable distribution, means of estimating costs, with information as to the best methods under varying conditions.

Telephone Traffic Development Methods.—COAR.—*American Electrician, July.*

At an earlier time the traffic department of a telephone exchange was considered of minor importance. To-day it is recognized to be of the greatest importance.

OPERATING.

The wages of the operating staff constitute a principal item of expense, so that if the labor can be utilized to greater advantage more value will be produced by the same expenditure. Operators' ages should be between eighteen and twenty-five years, and a record of the qualifications of each applicant as to sight, weight, voice and reach should be kept on file, to enable candidates to be called when needed. Careful instruction before beginning work, including the meanings of terms, methods of handling apparatus, use of proper phraseology and proper inflection, and skill in one hand as well as the other, are important steps in the instruction of the novice. Training in a small office does not always fit an operator for success in a large one. Praise as well as correction is essential in the improvement of the operator's efficiency. Two hundred calls per hour is a fair load at a subscriber's position in a central energy office. Measured and pay station service decrease the operator's load. By means of the peg count information relative to a proper distribution of service is obtained. Two charts of peg counts show vividly the conditions which existed at the time they were taken. That showing the number of calls per position has for its lesson that the total traffic is not well distributed between the positions; also that a use of the intermediate distributing board in obedience to the story told by the curve would have shown a very different curve picture if the peg count had been repeated thereafter. The curve showing total calls received in twenty-four hours is instructive as showing what happened as the day progressed and came to a close. This particular curve is remarkable in that the peak of the load came at 8:30 a. m.; that the lunch hour seems to have been from 11:30 to 12:30, and that there seems to have been little or no tendency to the production of an increased traffic after the evening dinner. With reference to the early maximum traffic and the lull at noon, one is inclined to wonder whether the town in which the test was made has not a considerable difference between standard and local time. To know the character of service to supplement the knowledge of its quantity, service tests must be made, and it is better to make them from the central office with proper mechanism than to visit subscribers' stations. Means of setting up such apparatus and of recording the results are well described.

Weather Forecasts by Telephone.—SMYTHE.—*Telephony, July.*

Weather forecasts are being distributed over country telephone lines in a large way. Many states have such arrangements, but Iowa distributes the service to about 40,000 farmers.

The Peg Count in Central Office Operation.—O'BRIEN.—*Telephone Journal, June 25.*

Of the several methods by which an accurate record may be obtained of the number of originating and incoming calls during the period of a count, the method preferred by the author is that of ticketing each call. Flat rate calls are recorded under the number of the calling subscriber only; message rate calls include also the number of the called subscriber, and pay station calls include that and a record of the time of the conversation. This adds no burden of ticketing to the work of the message rate and pay station operators, but imposes on flat rate operators an additional drag during times of counting. Incoming trunk operators are to have registering devices and it is of value to have precautions against overcounting. As illustrating the differences in the capacity per position per day under the influence of different kinds of service, the author gives the relative figures of 1,800 flat rate calls, 800 message rate calls, and 500 pay station calls. Two important things may be controlled upon the basis of information gained by the peg count. One is the providing of call circuit trunks at the time when ring-down trunks are no longer economical because of a sufficient growth in trunk line traffic between certain offices; the other is the periodical redistribution of subscribers' lines in order to equalize the load upon the subscribers' operators; and this equalization is accomplished by means of the intermediate distributing board. Means of determining what lines and what kinds of lines to place upon a position to give it an average load are described.

The Use of the Telephone on Railroads.—FRANCIS.—*Telephony, July.*

A paper read at the twenty-third annual convention of the Association of Railway Telegraph Superintendents, on the economy and extent of development of the use of the telephone in railway work. The facts given cause one to wonder why so important an industry as transportation should have been so slow in appreciating the advantages of communication.

Manila, P. I., Telephone Service.—RIGGS.—*Electrical Review, June 18.*

The present telephone service is said to be highly unsatisfactory. The instances cited are of the usual sort, but apparently even more maddening than experiences in the states. Because it is believed another native uprising is coming, the writer does not anticipate an early rebuilding and improvement of the telephone plant and service.

The Telephone in Railway Work.—KAISER.—*Telephony, July.*

A paper read before the twenty-third annual convention of the Association of Railway Telegraph Superintendents. Railway telephone service was first installed for the mere accommodation of the public, but it is now extensively

used in the operation of the railway system because it has been found to be an economical method. Since telephone service has come to be used extensively, such changes in railway work have been possible that, if the telephone were taken away, immediate congestion of transportation would ensue.

Telephone News Bureau.—WEST.—*Telephone Journal, June 18.*

The Philadelphia *Evening Telegraph* has inaugurated a free information bureau, and places within the reach of the 15,000 subscribers of the local Independent Telephone Company a news service of great magnitude. Queries with reference to any matter upon which a newspaper might be expected to have knowledge are answered without charge; and in the case of information of particular value, the newspaper takes the initiative and distributes news as widely as possible.

Strike in Holborn Exchange.—Electricity, London, July 1.

On June 25 the operators in the newly opened Holborn office of the National Telephone Company, London, laid down their instruments as a protest against increased hours. Former service was 47½ hours for the week, and this had been increased to 54 hours per week. Work was resumed pending an investigation.

Chicago Freight Tunnels.—RUTHERFORD.—*The World Today, June.*

The telephone tunnels of Chicago, designed to accommodate electric traction for freight delivery under the intense business center, now are twenty miles in extent and are the first instance in the world of such a method. The capacity of the system will ultimately reach 300,000 tons per day.

GENERAL TELEPHONE ENGINEERING.

The Telephone in the Japanese Army.—Telephone Journal, July 9.

Japanese successes in war are due in a degree to superior signal service. The telephone was found highly advantageous in the late British campaign in the Soudan. As Japan has many government engineers well trained in telephone engineering, these civilians have put on the uniform and undertaken emergency communication work of great importance, and the results of various actions have shown the value of their work. In one instance the two wings of the Japanese army were swinging into such position as to endanger each other by their fire. A telephone message corrected this condition at once.

Divided Multiple.—BEYLAND.—*Sound Waves, July.*

The second of a series. Divided multiple systems are not generally used in this country, but are more popular abroad. A two division common battery system will be installed in St. Petersburg, and one in Berlin. These systems are being engineered in America. The author says the number of multiple jacks required in a switchboard varies as the square of the number of sections. The American tendency in exchange engineering is to solve the telephone problems of the community to determine the minimum cost of owning, operating and maintaining the entire structure, and the arrangement of offices which will accomplish this. To have many branch offices diminishes the cost of the outside plant per subscriber, but increases the operating expenses in other ways. The author believes the single large central office will grow in favor as against a number of smaller central offices, because of improvements in the economies of line distribution. Seven forms of divided multiple circuits are illustrated and described, the method of operation of each and the reason for its design being given.

Typical Private Branch Exchange System.—KELSEY.—*Sound Waves, July.*

For the reason that with private branch exchanges the city traffic of a private group of telephones is concentrated on a few trunk lines heavily used rather than being carried on a larger number of individual lines less heavily used, private branch exchanges tend to diminish the amount of central office investment even though the total traffic remains the same. Besides this saving, the fact that the subscriber provides the services of an operator in the private branch exchange assists somewhat in reducing the telephone company's expense. Private branch exchange development has been greater since the flexibility of central battery equipment has been available. One of the features of this flexibility is that with central battery systems all the telephones in a private branch exchange may be served with current without having a power plant or a battery of any kind on the private branch exchange premises. If current is carried to the private from the public exchange over cable conductors of considerable length, cross talk will result in local connections unless a remedy be applied. The usual remedy is to place a capacity of 20 mf. across these leads. In the system which is described, current is supplied to the cord circuits in the private branch exchange from such a source as this, except when the connection is between a local subscriber and a trunk line. In this case a relay in the cord circuit operates to cut off the connection to the group of condensers, and current is supplied to the subscriber from the central office quite as if the subscriber's instrument was directly at the end of an individual line. Whether or not the signals in the private branch exchange switchboard shall operate at all, whether they shall operate in unison with the supervisory signal in the central office, or whether they shall operate in response to the subscriber's hook movements, and the central office signal operate in response to the existence or absence of the private branch exchange connection, are matters to be decided in designing and operating the private branch exchange switchboard. Authorities differ as to the best method. During night and holiday hours, certain stations in a private branch exchange may require to be connected through to the central office, and this is very conveniently done in a common battery equipment, enabling the central office to call the stations directly, even though the private branch exchange operator is absent. With even a few trunks a considerable number of local stations may be connected to them at night and called in a party line manner.

Telephone Conditions in the Orient.—Telephone Journal, July 2.

Taking the great east as a whole there are 400,000,000 people to be provided with telephone service. At present the development is about 1-200 per cent. In India one of the deterrents is the striking limitation of caste, and it is met in the telephone business in very many ways. In China the development is limited but increasing. In Japan it has been most rapid, all large towns having telephone systems, and American ideas are being assimilated rapidly. The Japan systems compare favorably with those in the United States. In the construction of pole lines in the Orient, precautions not necessary in America must be taken. The rank growth of vegetation requires vigilance to keep the lines reasonably insulated; and wild animals attack the poles so that iron or iron and wood poles are necessary. Forty thousand poles with iron bases and wood tops were recently furnished for eastern use, by an American firm.

The Telephone System.—WOODBURY.—*Electrical Age, May.*

In an address before the Insurance Society of New York the protective system used by the Bell companies is described in considerable detail, but without illustration. The general usefulness of telephone systems, their complexity, and something of their character are presented as having a bearing on the making of rates for the insurance of telephone equipment.

Improving Private Branch Exchange Service.—KNOWLTON.—*Western Electrician, June 25.*

The private branch exchange has been one of the most important factors in developing the extent and character of telephone service. In Washington, D. C., at the beginning of the last year, 29 per cent of the Bell telephones were in private branch exchanges, while in New York the percentage was 33. In addition to the advantage of providing a convenient local service between the stations of the private

branch exchange, the regular exchange service is secured at a lower cost, when the number of local stations is greater than the number of trunk lines. The possession of special knowledge by the private branch exchange operator enables her to place the incoming calls in a more effective way than could be done by the calling subscriber himself, as he knows what information, but not what person, he desires. The excellence of private branch exchange service, and, even more important, the final excellence of the service of the whole system, depends in a marked degree upon the efficiency of the private branch exchange operators. Tact and courtesy are essential. In some systems the operator is not necessary. Each local station has means for calling the others, or the central office, but the advantages of such an arrangement are not of such high degree as where operators are employed. The larger part of the article is devoted to pointing out the details in which private branch exchange service needs attention in order to reach a high standard of excellence.

Kankakee, Ill., Independent Exchange.—Western Electrician, July 2.

A central energy system with a present equipment of 1,560 lines. The underground system has 16,000 feet of duct, and 50,000 feet of cable are used in the underground and aerial construction. The towns of Bradley and Bourbonnais are included in the Kankakee system.

People or Freight Underground?—HYDE.—*Technical World, July.*

The tunnel system of the Illinois Tunnel Company, originally announced as a means of distributing telephone lines in Chicago, is now arranged for transportation. Whether the idea of utilizing it for that purpose was the original and principal one, or whether it was an afterthought, is uncertain. The right to carry on a transportation business was granted to the company after its reorganization under the above mentioned name in July, 1903. Contracts are about to be closed for 150 electric locomotives and 3,000 freight cars, Fifty thousand tons of freight per day is the capacity intended to be handled within eighteen months from this date. The existence of the tunnel system permits architecture which takes the tunnel existence into account as affecting the incoming of supplies, notably fuel, and the outgoing of product. Twenty-five railroad trunk lines are touched by the business center of Chicago in which the tunnel system lies. The tunnels ultimately will reach all parts of the city, and at least 100,000 telephones are to be served.

Telephone Engineering.—KELSEY.—*Electrical Review, July 9.*

In this seventh article of the series, the single battery repeating coil system is treated, trunking methods in that system being the immediate topic. In the multi-voltage repeating coil system the trunk from one office to another was provided with a listening key and a plug switch. The purpose of the latter was to place the disconnect lamp in service when the trunk plug was lifted for use. So far as they have been developed, plug switches are believed to be unsatisfactory principally because they are susceptible to lint and dirt carried to them from and by the cords. In the single voltage system this disadvantage was avoided by the use of a new trunk design and the listening key was eliminated by inserting an arrangement of automatic mechanism ingeniously related to the other parts of the circuit. The elimination of both listening key and plug switch defects has acted to improve very greatly the incoming end of the trunks between central battery offices. The article is illustrated with three line drawings and exhaustive description of the apparatus, including machine ringing. This is an arrangement of apparatus which enables the ringing of the subscriber's bell on an incoming trunk call to be given when the trunk plug is put up and to continue in intervals until the subscriber answers. On hanging up the telephone the ringing does not begin again, but the disconnect signals are shown.

Fighting Electrical Fires.—COAR.—*Telephony, July.*

Electrical fires in this case mean fires in or about electrical apparatus, whatever the cause. Water or chemical solution damage in a telephone equipment fire is often as great or greater than the effects of the fire. Fire extinguishers in the form of powder are a very attractive form of fire fighting material. Great care must be taken to prevent the excessive use of water or of destructive tools in the hands of the fire department.

WORK TO START ON CINCINNATI INDEPENDENT TELEPHONE SYSTEM.

Harry B. Gates of Indianapolis, who is one of the officials of the Queen City Telephone Company, which has at last secured a footing in Cincinnati, states that work on the system will be begun immediately.

The members of the company and their engineers have examined the map of the underground district, and discovered that the obstacles to be overcome under the street surface are not of a serious character. The underground system can be installed with very little trouble, Mr. Gates states, and without great inconvenience to the public.

The company is looking over several sites on both sides of the canal for its central exchange. "We do not need a skyscraper, but we will erect a splendid building, nevertheless," said Mr. Gates. "We will lay out the building so that it may eventually provide for 100,000 subscribers. We have not decided yet as to the kind of instruments will be used. The public seems to want the automatic telephone, such as is in use in Chicago, Dayton, Topeka, Grand Rapids and other places. We will experiment with this instrument before adopting it. It will cost us $3,000,000 to get the Cincinnati system in operation, but when it is ready it will be the finest in the country. No expense will be spared."

LONG DISTANCE TELEPHONE WEDDINGS.

The first long-distance telephone marriage to take place in New York state was performed in Warren and Erie counties recently. Ottomer Hammerlee, a young attorney of the Erie County bar, and Miss Mollie Zimmerman, of the same county, both of Springvale, accompanied by a friend, went to the Iroquois Hotel in Buffalo, while at the same time the Rev. O. L. Warden, pastor of the Warrensburg Baptist Church in Warren County, and Mrs. Warren went to the village telephone exchange.

The five—three in Buffalo and two in Warrensburg—were put in connection, each being supplied with a receiver. The clergyman, recognizing the voices of the principals at the Buffalo end, had no hesitation in pronouncing them husband and wife, to which Mrs. Warren and the Buffalo friend will be witnesses. The clergyman was Miss Zimmerman's pastor for five years, and it was at her desire he was chosen to perform the ceremony. The long-distance method was selected for convenience and a desire for the unusual.

Another marriage of this same sort was recently solemnized near Hutchinson, Kansas. Judge R. A. Campbell performed the ceremony sitting in his house and talking away into the country. The couple joined hands at his request and, with an ear to the telephone, one at a time, they listened to the words of the judge and made the correct replies. Then he pronounced them man and wife. The young people were Frank Gould and Miss Mary Heibert, living in the country. They did not want to take the time to go to the city.

In 1893 there were about 9,000 telephones in use in New York city. To-day there are over 132,000. In the last three years alone, 76,000 have been installed.

Subway Construction

D. R. CRAIG

D. R. CRAIG.

At the present stage of development in the Independent telephone field, little or no argument should be necessary in favor of the installation of underground construction. The best methods show that it should be used, at least to some extent, in every plant. Even in small country exchanges its advantages are apparent, though no other use be made of subways than to conduct the main cable leads from the poles outside the exchange into the building itself, thus doing away with cables or hundreds of open wires entering the walls or windows of the central office, together with the necessary anchorage to the structure, and the constant liability to trouble and danger. How much more workmanlike and neat to have all wires conducted in cables from the nearest poles into the ground, thence to the cellar of the exchange, and up through a chute to the terminal room. The absence of future trouble, to say nothing of the convenience, amply justifies the expense. In the larger exchanges the advantages of subways have been amply proven. They are no longer an experiment either as to efficiency or economy. No telephone plant, whether it be in a town of five thousand inhabitants or a metropolis, can be considered modern or constructed under the best methods, unless it has a fair percentage of subway construction, and the larger the percentage the better the plant.

How to arrive at the amount of subway to be used is the first question that arises in the building of a new telephone plant, and in this several things have to be taken into consideration. The size of the city, the manner in which it is built, whether congested or scattered, the amount of foliage along residence streets, the availability of alleys and the kind of pavement in use are some of these. It is taken for granted that the plant is to be constructed for the purpose of furnishing telephone service to any part of the city, so the larger the city the larger the plant, and the larger the plant the greater the amount of underground construction to be used. As a general proposition the business district of a city should be fully supplied with subways, so that all distribution in the congested districts may be made by that method. Many companies do not stop here but carry their subways well out into the residence portions, especially into heavily populated residence districts or along prominent streets where the presence of heavy foliage would necessitate expensive aerial construction. If a city is well supplied with alleys they may most frequently be used for the subways, and in other cases, away from the center of the city in more isolated localities, be taken advantage of for the construction of pole lines, thus doing away with subways in the streets of those localities. These are questions to be decided by the engineer laying out the plant. Just as there are more ways than one of killing a sheep, so, in the majority of cases the subways of a telephone plant may be laid out to avoid streets covered with expensive pavement, such as asphalt, which has to be replaced, and results as to short distances and direct routes still be attained. This is obviously not always the case, but a competent engineer will be quick to take advantage of such conditions where they exist.

In many cases the franchise granted to the telephone company prescribes certain boundaries, within which subway construction is compulsory. But even in these cases the company should have some provision allowing it to extend its subways into districts farther out in case it so desires or it becomes advisable. Such permission is not difficult to secure from municipalities for the present tendency is to compel telephone, telegraph and electric light companies to place their wires beneath the surface. This cannot be taken as a hardship, for the increasing number of circuits in city streets is a menace to both life and property when placed overhead, beside, from the operating companies' standpoint, impairing the service and increasing the cost of maintenance.

Once the territory to be supplied by the subways is decided on, the next thing is to lay out the routes. This

EXCAVATING FOR SUBWAY.

should be done with a view of giving ample distribution to every block in the subway district, and also to reach the boundaries of the district at all points where aerial leads will begin, and with the shortest and most direct lines from the exchange. To do this properly the ground must be gone over very thoroughly and studied from every standpoint and under every condition. A handy and almost necessary adjunct is a map of the district to be covered. This can be made by taking such a city map as one is always able to find, and making from it an enlarged map of the territory where the subways are to be constructed. With such a map one can follow out the streets or alleys that are best to use, and the shortest available distances, and then "check up" the routes so laid out by actually going over the ground to familiarize oneself with it and also discover what reasons, if any, there are that these routes cannot be used.

All records in the city engineer's office, of pipes already laid in the streets, should be consulted, although it is surprising how incomplete, as a rule, these records are, even in large cities, where one would think careful and correct memoranda of all such work would be kept. The records of other companies occupying space underneath the streets

Note.—The next article in this series will take up in detail the method of doing subway work.

should also be consulted. In these ways one is enabled to choose a location on the streets where it is best to place his work without interfering with the service of others and presenting as few obstructions to his own work as possible.

The writer's experience has been that the best location for subways is within nine feet from the curb, as at that distance there seems to be less liability to encounter other work that may occupy space under the streets. Four feet from the curb is a good distance, as other pipes are rarely laid that close to the curb, and it still gives room to clear sewer catch-basins at street corners. Sometimes on residence streets it is possible to secure permission to lay your work in the parkways or tree banks outside the curb, city authorities and property owners preferring that location rather than have the street pavement torn up and replaced. Of course, when this can be done it is a cheaper proposition for the company. Care must be taken in this case, however, to avoid injury to the roots of large shade trees and to lawns.

LAYING THE CONDUIT.

The size of the subways is to be considered after the routes have been laid and the locations decided on. In this item not only the present requirements must be taken account of but a liberal allowance made for future growth. The tendency in the past has been, and even now is, not to make the subway capacity large enough. The rapid growth of the telephone business, exceeding even most sanguine expectations, should be incentive enough to build with ample capacity and a sharp eye to the future in subway work, where additions above immediate requirements are easily and economically made at the time of construction, while to increase several years hence the size of the subway plant already built is an expensive proposition. The size of main or trunk cables to be used largely governs the size of the subways, four-hundred-pair cables naturally giving twice the capacity of two-hundred-pair, while occupying only the same number of ducts. The former size is coming into more general use, especially in the larger cities, though the two-hundred-pair is still used in a greater number of cases. The subways should be built large enough to accommodate at least fifty per cent more telephones than the number figured on for the ultimate capacity of the exchange. At first glance this may seem extravagant, but it is not, for several reasons. It has often been found that the ultimate capacity of an exchange has been soon reached and passed, when its projectors or builders thought they had made ample provision for all time, and so their plants have had to be increased in size just at a time when they should be promptly taking care of the rush business coming to them. Then again it must be considered that there is a probability of the municipality arranging for the use of one or more ducts for the carrying of police and fire alarm wires. Very often this provision is made in the franchise.

Many times it may be thought necessary to increase the cable capacity, in a certain locality, to a small extent, not requiring a large cable, but the small cable occupies one duct, the same as the larger one. These things, taken in connection with the permanence of underground work, and the difficulty and expense of adding to it, as stated before, give ample justification for the installation of a much larger capacity than at first required. In a plant where the capacity is figured at 10,000 telephones, a subway plant capable of caring for 15,000 telephones is none too large. In view of the slight additional cost of the extra insulation at the time of first building, and the small amount of extra capital tied up, the investment is a good one.

Every wire and cable should enter the exchange through the subways, so at that point the number of ducts will be the greatest. They should lead from this central point to all directions of the compass, the number decreasing as the different distributing points are reached, arriving at the underground district boundaries with sufficient capacity to supply the aerial leads which begin there. This is another point which can only be decided by thoroughly going over the ground.

Manholes, or vaults, in underground construction should be located at junction points, at corners or severe angles in the line, and on straight lines at an average of four hundred feet apart. In overcoming obstructions or getting around, over or under barriers it may also be found necessary to place extra manholes that were not figured on or could not be foreseen when the work was first laid out. These manholes may be of different shapes and materials. Their construction will be taken up in another article for that is a subject in itself.

CONDUIT COMPLETE IN TRENCH.

With the foregoing points decided one may now outline on the map already made the routes, probable locations of lines in the streets and the locations of manholes, showing the distance between manholes as ascertained by actual measurement and also the number of ducts to be laid. In fact this map should be as complete as possible for it will be used as a working plan. In cases where the work is to be done by contract, the details will have to be thoroughly worked out, and the plans accompanied by a full set of

specifications, so that the contractor can make an intelligent bid on the work.

The question of permits for doing the work is one that is covered either by a general ordinance of the city or by the company's franchise. The usual procedure is to file a copy of the general plan of the proposed work, together with a written description and an application for a permit for the work, with the city engineer, superintendent of streets, commissioner of public works or such other official as may be designated, and the permit is issued by him. This same official, or an inspector appointed by him, to follow your work, is the one appealed to for the settlement of all controversies arising during the prosecution of the work with property owners, officials of other companies occupying space under the streets, and in the replacing of street pavement. It may be said in passing that in a well managed piece of work there is little or no need for controversies. System, efficiency and promptness in the work, little or no interruption to traffic, courtesy and willingness to lend a ready ear to city officials having jurisdiction, and a due regard for the rights of others, will avoid unpleasantness and redound to the credit of the company doing the work.

FIRST ANNUAL CONVENTION OF SOUTH DAKOTA TELEPHONE ASSOCIATION.

That the Independent movement is rapidly gaining ground in the Dakotas was evidenced by the enthusiasm shown at the first annual meeting of the South Dakota Telephone Association, held in Canton, that state, July 7 and 8. The organization has been perfected less than a year, yet in spite of this fact there was a large attendance of telephone men from all parts of the state, and creditable displays of telephone apparatus were made by nearly a dozen of the prominent manufacturing concerns, which were highly complimented, both by the delegates and the citizens of Canton, who evinced the liveliest interest in the various exhibits. The several sessions of the convention were held at the court house. No papers were read, the time being devoted to general discussions on topics of interest to exchange managers. It was shown that the Independents are experiencing a wonderful growth in South Dakota and that in proportion to population that state is producing as satisfactory results in the Independent cause as any other state in the union. It was not expected to accomplish much at this session of the Association, the meeting being more for the purpose of getting things in shape for the convention which will be held in January, 1905.

Both the president, C. C. King, and the vice-president, W. E. Ege, were prevented from attending the meeting by unexpected business matters which developed at the last moment, so in their absence Judge C. B. Kennedy was chosen to act as president *pro tem.* The matters which were discussed were the adoption of by-laws for the government of the society. The aim of the South Dakota Telephone Association is to advance the interests of Independent telephone lines of the state, and insofar as possible bring about a system of co-operation of the various companies, which means added profits, by serving their patrons in a larger manner.

It had been planned to close the convention with an elaborate banquet at the Rudolph hotel, but at the last moment the chef was called out of town by the serious illness of his mother and that feature of the gathering had to be abandoned, much to the disappointment of all. A partial list of those present and the South Dakota exchanges they represented were as follows:

J. W. Wipf, Freeman Telephone Exchange, Freeman; H. P. Hartwell, Tri-County Telephone Company, Irene; A. P. Hoard, Alcester Telephone Exchange, Alcester; M. B. Ryan, Beresford Telephone Exchange, Beresford; M. B. Ryan, Elk Point Telephone Company, Elk Point; E. R. Buck, Hudson Telephone Company, Hudson; Alex. Ross, Webster Telephone Company, Webster; E. A. Bruce, Independent Telephone Company, Yankton; E. C. Ward, Missouri River Telephone Company, Yankton; Judge C. B. Kennedy, C. B. Waldo, Canton Co-Operative Telephone Company, Canton; W. H. Wasem, J. L. Kehm, L. P. Meinzer, North Lincoln Telephone Company, Harrisburg; William Gerricke, Lennox Telephone Company, Lennox; J. L. W. Bietlow, Dakota Central Telephone Company, Aberdeen; J. A. Steninger of Parker—Hurley, Marion and Parker Telephone Exchange; George W. Burnside, Citizens' Telephone Company, Sioux Falls; B. W. Burnett, Tyndall Telephone Company, Tyndall.

The different manufacturing concerns and the men who represented them were as follows: Monarch Manufacturing Company, Chicago, A. J. Carter; Eureka Electric Company, Chicago, H. J. Kusel; Vought-Berger Company, La Crosse, Wis., J. C. Ball; Stromberg-Carlson Telephone Manufacturing Company, Chicago, C. W. Bartlett; Standard Underground Cable Company, Chicago, E. J. Pietzcher; Electric Appliance Company, Chicago, J. K. Allen; Interstate Supply Company, Sioux City, Iowa, J. W. McGraw; Sterling Electric Company, Lafayette, Ind., Evan Shelby.

It was voted to hold the next meeting of the Association on January 11, 12 and 13, 1905, at which time a much more extensive programme of papers, addresses, etc., will be carried out, to close with a big banquet at which a number of prominent telephone men will speak.

The officers of the South Dakota Telephone Association are as follows:

President—C. C. King, Scotland.
Vice-President—W. E. Ege, Centerville.
Secretary-Treasurer—H. P. Hartwell, Irene.
Executive Committee—J. A. Steninger, Parker; F. B. Elge, Mitchell; T. P. Thompson, Canton; B. W. Burnett, Tyndall.

TELEPHONE EXCHANGE SUSPENDED IN MIDAIR.

One of the marvels of modern American methods in constructing buildings recently attracted attention in New York. A brick and iron building swinging in midair is the sight that was seen. While literally the structure was swinging from two tripod arrangements, the statement might be misleading to some who might be led to believe that they could expect to see it swaying to and fro in midair. This was the means taken to shore up the building during the process of making some additions to the Madison Square Exchange of the New York Telephone Company. The *Engineering News* gives full facts about the operation, from which some extracts are here made.

Perhaps no kind of business or building would be encountered by a contractor that would present more difficulties than those met with in a telephone building. The numerous wires entering the cellar of a central station, their running up to the several stories, their distribution close to walls and under the floors to scores of operators, the need of protection from noise, dirt, rain and the usual concomitants of building operations, make an alteration in a telephone central station one of rare difficulty.

The process adopted was much more expensive than the usual method, but was adopted as the only practical way of complying with the somewhat exacting conditions. The members of the firm which did the work and with which the idea is an entirely original one, submitted the plans to a number of architects, builders and persons engaged in similar work, and none would give it a hearty endorsement. All, however, regarded it with intenese interest and watched the progress of the work from start to finish. It was a perfect success in every way.

MONOPOLY OF THE TELEPHONE BUSINESS IS AGAINST PUBLIC POLICY.

The Supreme Court of Alabama used the following pertinent language in a case decided by it recently: "No one public corporation should be given a monopoly of the kind (telephone business) to the exclusion of others in the use of the streets of a city. Ordinarily such privileges should be granted, equal with and not superior, to other like enterprises established for the use of the public. The state licenses such enterprises not simply that the owner of them may earn profits by establishing and operating, but that the general public may enjoy the benefits of their existence, and when two are authorized by law to use the same street or avenue, it should be with the express or implied condition that each shall respect the rights and interests of the other and occasion no injury or harm to the other."

A suit was brought in 1903 by the American Telephone and Telegraph Company of Alabama enjoining the Morgan County Telephone Company from using the streets of New Decatur of that state. The evidence disclosed the fact to be that each company had a franchise in the city. The complainant company alleged, among other things, that another telephone business in the town would greatly injure complainant's business, and therefore sought the injunction. Upon being carried to the Supreme Court the language above quoted was pronounced. The purpose of the injunction, which was plainly to maintain a monopoly of the telephone business in the city and to exclude the Morgan County Telephone Company from any participation therein, was evident, and the decree of the lower court dismissing the complaint was affirmed.

American Telephone and Telegraph Company of Alabama vs. Morgan County Telephone Company, 36 South, 178.

DAMAGES FOR WILFUL TRESPASS.

It is the rule in Kentucky, as declared in a recent decision, that where a company enters upon the land of another against the will and consent of the owner, and digs holes in the ground and erects telephone poles, that in an action for damages the owner is entitled to have the jury instructed that if it finds the entry on the land to have been malicious, the owner is entitled to recover exemplary damages, i. e., a greater sum than the actual damage sustained by the trespass, and damages in the way of punishment.

Johns vs. Cumberland Telephone and Telegraph Company, Court of Appeals of Kentucky, 80 S. W. 165. Reversed April 13, 1904.

PERSONAL INJURY CASE IN KENTUCKY.

The Cumberland Telephone and Telegraph Company had some men engaged in digging holes for telephone poles in Shelby County of the above state and was using dynamite to make excavations. Thomas L. Harp, one of the workmen, was directed to finish digging a hole in which some unexploded dynamite remained covered by mud and water, and when Harp commenced digging it exploded and injured him. Harp had no knowledge of the presence of the explosive in the hole. In a suit for damages for personal injuries by Harp, the Court of Appeals has held that an instruction that plaintiff could not recover unless defendant, or its agent in charge of the work, knew, or by the exercise of ordinary care could have known, that the explosive remained in the hole, was erroneous, since defendant's duty to furnish a reasonably safe place to work required it to know that there was dynamite in the hole, and to have removed it or warned plaintiff of the danger. The court further said that the fact that the dynamite was left in the hole by a fellow servant was immaterial.

Harp vs. Cumberland Telephone and Telegraph Company, 80 S. W. 510.

COMPANIES BOUND TO FURNISH SERVICE INDISCRIMINATELY.

The Kinloch Telephone Company was recently made defendant in a suit brought by one Payne of St. Louis, Missouri, to compel the company to furnish service against its wishes to the Keystone View Company. The facts under which the litigation was occasioned were briefly as follows: A contract had been entered into by the telephone company with the View company by which service was to be furnished to the patron in question at the rate of $60 per annum, service under agreement to continue for five years. Payment was to be in advance, which was made for some time, until, according to the allegations of the plaintiff, the service became poor, when payment was stopped. The telephone company was given notice to repair the equipment, and after some delay this was done. Demand was made of the subscriber for full payment for all the interval in which the service was inefficient and on being refused payment the telephone was removed from the premises.

Suit by mandamus was thereupon begun by the Keystone View Company to compel the re-installation of the telephone in their premises. The defendant set up in defense that a rule existed which forbade the re-installation of any instrument in premises where it had been removed for nonpayment of rents. This rule, however, had not been called to the attention of the subscriber. Two points were before the Court of Appeals at the hearing therein which are important: (1) The question of the duty which a telephone company is under to furnish service against its will. (2) The question whether the plaintiff was in any way bound by the rule of the telephone company above stated. The Court said in answer to the first question that the liability of telephone companies to furnish service to everyone was very similar to that placed upon innkeepers, warehousemen, gas and water companies and other allied quasi public concerns. "Telephone companies are regarded by the courts as performing functions similar to those of railway, steamboat and express companies, which conduct a general carrying business." Under the law as applied to these companies and corporations the Kinloch Telephone Company should have furnished the subscriber with service. The telephone company's objection that the rent had not been paid for the interval, the Court thought to be no defense. The telephone company should have first installed the instrument as requested, have taken the advance rental for the instrument and then have begun an action in assumpsit against the subscriber for the balance in controversy. The second question involves a simple rule of law of inestimable

value in practical application. The rule of the company that no instrument would be placed in premises where one had been removed for failure to pay rentals had never been accepted by the subscriber and therefore had no application to the case whatever. The Court said: "If this alleged regulation had been communicated to these applicants when they made the contract, they might have been held bound by it, if just." But the rule had not been printed and in no way had been accepted by the subscriber. It therefore was no rule at all so far as binding the plaintiff was concerned. It is the law that a rule to bind the parties and be part of the contract must be understood by each, and actually or constructively be incorporated in the contract. Even if printed, if unread, doubt often arises in regard to rules being operative. It is always a matter for proof as a question of fact.

State ex rel Payne et al. v. Kinloch Telephone Company, 67 S. W. 684, Court of Appeals, Missouri, Mandamus granted.

COMPANY FAILED TO COMPLY WITH PROVISION OF STATE CONSTITUTION; THEREBY LOST SUIT IN ANOTHER STATE.

The Cumberland Telephone and Telegraph Company, which is a Kentucky corporation, found it desirable to secure a right of way over that of the Morgan's Louisiana & Texas Railroad & Steamship Company, and after failure to secure it peaceably began expropriation proceedings in the District Court of the Parish of Jefferson, Louisiana, to obtain the right of way over the defendant company's property. The Louisiana statutes provide for a jury trial in such cases, which was had and a verdict given the telephone company assessing the damages at $30 per mile. The defendant appealed and as one of the grounds of error set up the allegation that the Kentucky corporation was not by the laws of its own state authorized to expropriate property and could not, therefore, do so in Louisiana. It charged that the plaintiff had not observed, fully, the laws of Kentucky, and hence being illegally organized, so far as the question at issue was concerned, it had no right to take property under the Louisiana laws.

The history of the Cumberland Telephone Company shows that it is the product of several consolidations. In 1898 articles of consolidation were executed and filed between the Cumberland Telephone and Telegraph Company and the Great Southern Telephone and Telegraph Company, the former of Hopkinsville, the latter of Henderson, Kentucky. The new company took the name of the first mentioned corporation. In 1900 the consolidated company took in the Ohio Valley Telephone Company. Some time after the incorporation of the constituent companies the state of Kentucky adopted a new constitution containing a provision that no corporation in existence at the time of the adoption of the new constitution should have the benefit of future legislation unless it first filed in the office of the Secretary of State an acceptance of the provisions of the new constitution. In 1893 an act was passed by the Kentucky legislature authorizing consolidations. The Cumberland Telephone and Telegraph Company under this act took in the other companies. The constituent companies, however, had failed to file an acceptance of the terms of the new Kentucky constitution before the consolidation and the Supreme Court of Louisiana decided that this fact denied them the right to legally consolidate and come into another state and condemn a right of way over the defendant's property in question. The verdict of the jury granting the right of way was accordingly reversed.

Cumberland Telephone and Telegraph Company v. Morgan's Louisiana & Texas R. & S. S. Co., 36 South. 352.

HELPING FELLOW EMPLOYE OUT OF DANGER.

Is it contributory negligence for one employe, seeing another in danger, owing to the negligence of a third party, to attempt to rescue the fellow workman from the peril? This question was before the Supreme Court of Louisiana not long ago in the case of Whitworth v. Shreveport Belt Railway Company. Two linemen, Potts and Whitworth, employes of a telephone company, were engaged in stretching a line of wires upon poles. In doing so the line had to be passed above a span of the electric car system, the defendant in this suit. Potts, upon the telephone pole, was holding one end of the wire, while Whitworth upon the ground, was holding the other. The latter stumbled and in doing so dropped his end of the wire, which fell to the ground, and rested upon the span wire below, which, by the defective insulation in the hanger by which the trolley wire and the span wire were connected, was heavily charged with electricity. Potts, holding the other end of the wire, received a shock from which he fell instantly head foremost. His spurs caught on a spike on the telephone pole and he was left suspended in the air. Whitworth ran to the relief of Potts and taking up the telephone wire to break the connection, presumably, received a shock and was instantly killed. The negligence of the electric lighting company was beyond question and the only point to determine in the suit brought by Whitworth's relatives was whether the deceased committed an act of negligence in attempting to help Potts. Several persons stood near and warned Whitworth of his danger, but there were others who were making various efforts to help Potts. Whitworth rushed up and seized the wire without being fully cognizant of his danger, at least it was not shown at the trial that he knew the wire was charged. The jury in the lower court rendered a verdict in the plaintiff's favor, thus deciding that Whitworth was not guilty of contributory negligence. This verdict was sustained in the Supreme Court. The true test in these cases is whether the person seeking to rescue another has a reasonable belief that he will be successful. If such a belief exists he is not guilty of contributory negligence as a matter of law in endeavoring to do so.

Whitworth v. Shreveport Belt Railway Company, 36 South. 414.

NOT ENTITLED TO DAMAGES FOR TIME LOST IN TRYING TO GET COMPANY TO REMOVE POLE.

Suit was brought against the Southwestern Telegraph and Telephone Company by one Whiteman, alleging trespass by the company in erecting a telephone pole on the corner of an unoccupied lot which belonged to him. Evidence was allowed to be introduced, first of the amount of damages sustained in securing the removal of the pole, second that the wires on the pole were so near to his house as to subject the owner to great liability to injury if they were left. At the time of the trial, although the pole and wires had been removed, damages to the extent of $135 were awarded to Whiteman. The Court of Civil Appeals of Texas said that the damages awarded to Whiteman at the rate of $5.20 per day for time lost in getting the company to take up the pole were too remote and reversed the case. The Court also said that the only sum which Whiteman was entitled to was the damage to the property occasioned by the breaking of the soil and that since the pole and wires had been removed and the hole filled up $135 was entirely out of proportion to any damage sustained.

Southwestern Telegraph and Telephone Company, 81 S. W. 76.

SERVICE OF PROCESS IN GEORGIA.

The question of the sufficiency of service of legal process to require a corporation to make answer in a suit against it came up in the Supreme Court of Georgia lately in the damage suit of Roy Parker against the Southern Bell Telephone and Telegraph Company. Dr. Crumley was en-

gaged by the company to collect tolls from patrons and to make connections to other lines. When the above suit was commenced the papers were served on him. The company contended that the service on one employed as Dr. Crumley was could not be considered sufficient. Under the Georgia statutes service on any "agent or officer" of a corporation of the class of telephone companies is sufficient. The court said that the law does not intend that service on any employe of a corporation is binding, but if Cromley was an agent that the company was held. Considering his duties the Court declared Cromley the telephone company's agent and held the service sufficient. A further point of interest arose from the fact that Cromley had never notified the company of the beginning of the suit, which the service was meant to do. The company was bound by the notice to Cromley, notwithstanding the fact that no officer or person in authority had ever received the notice.
Southern Bell Telephone and Telegraph Company, 47 S. E. 194.

TELEPHONE CONVERSATIONS.

In an action to recover a balance alleged to be due from a Chelsea, Massachusetts, party to another in Boston, the testimony of a third person, who heard the Boston party talk with some unknown person who, the plaintiff testified, was the Chelsea man, as to what the Boston party said over the telephone, was held admissible to establish the matters discussed in the conversation.
McCarthy v. Peach, 70 N. E. 1029.

NOVEL IDEA FOR TELEPHONE.

D. H. Ely of Iroquois, Illinois, has found it very inconvenient to personally manage a sawmill, which is located three miles from his home, and other business, and decided that a telephone would be of assistance. But it was seen at once that the ordinary telephone bell could not be heard above the noise of the machinery; and when the mill was not in operation the men would likely be at the river fishing, and the telephone, so far as concerned its use from the home office, would be worthless.

A plan next thought of was to provide an extra large bell with batteries so powerful that the bell, under favorable conditions, could be heard several hundred yards. But it was feared that even this could not always be heard above the noise of the machinery while in operation. It has now been decided, in addition to the bell, to construct a device connecting with the whistle of the engine boiler. With this arrangement it will be possible for Mr. Ely to keep in touch with the doings of the mill while at his home office without interfering with his other business. He can receive communications any hour of the day, and not only direct the business at the mill, but by simply pressing a button, can notify the mill men, as well as the entire neighborhood, when the noon hour comes.

MINNESOTA INDEPENDENTS TO MEET.

The Minnesota Telephone Association will hold a convention in Minneapolis on August 31 and September 1. Two open meetings will be held and arrangements have been made to hold these meetings at the fair grounds on the afternoons of the dates in question. Executive sessions will be held in the executive building on the fair grounds. Every effort is being made by the officials of the association to secure a large attendance and it is expected that there will be a good showing of exhibits by the leading telephone supply houses of the west and middle west. A number of interesting papers will be read, and it is understood that one of the chief speakers of the convention will be J. J. Nate, who is known far and wide in the telephone field and whose affability has won for him the sobriquet of "Sunny Jim." Mr. Nate's subject will be "The History of the Telephone."

NIKOLA TESLA'S LATEST DISCOVERY.

Nikola Tesla, the famous electrician, has invented a device, which, he asserts, will do away with newspapers, and transmit messages to the uttermost parts of the earth. He says that discoveries made in Colorado showed him that the earth is a conductor of limited dimensions, and that it is possible to impress upon the whole globe the faint modulations of the human voice. Having established these facts he set to work to develop a magnifying transmitter which would make the modulations louder and stronger. He is, through the generosity of J. Pierpont Morgan, building a gigantic transmitting tower at Wardencliff, Long Island, from the top of which will be sent massages that are to circle the globe. If the system does all that the inventor claims, it will be possible for a man to stand in the midst of the desert of Sahara, and by means of an inexpensive instrument, which may be carried in the vest pocket, receive news of events in London and New York. Though Tesla may be a very clever man, we may be permitted to doubt whether his invention is such as to be within measurable distance of abolishing the daily newspaper. But it is not safe in this day of rapid advance to prophesy too surely, and who can tell what may come?—*The Canadian Engineer.*

LONGEST PRIVATE TELEPHONE WIRE.

From the Grand Central station in New York city to the Grand Central station in Chicago is a long stretch, but the New York Central Railway has projected a scheme that will bring these great throbbing centers within a second's call. The two terminals of the greatest railway system in the world are to be connected by means of a private telephone system. The general public, to be sure, will not be allowed to use it, but the railway company, in its fight to keep down expenses and thereby promote the stock dividend cause, decided on this plan of fighting the telegraph companies. The work of inaugurating the system has actually begun. The route of the telephone line will lead from New York up the Hudson river to Albany, through Syracuse, Rochester, Buffalo and Cleveland to Toledo and thence along the route of the Lake Shore railway to Chicago.

CUPID CRIPPLES MUNCIE "CENTRAL."

"Our telephone service isn't as good as it was; in fact, it isn't good at all, but we hope to get better," admitted General Manager Thomas Bromley, of the Delaware and Madison Counties Telephone Company at Muncie, Indiana. "The truth is," said he, "that the marriage of our pretty telephone operators is the cause of our trouble. No sooner do we train a girl until she becomes an expert than somebody marries her. In the last few weeks six of our skilled operators have left the exchange, which cripples the force. I don't know what to do about it unless we employ homely girls in the future, and then I'm not sure that would help, for I believe men fall in love with the girl's voices before they see them. We must get some ancient spinsters with rasping voices; but then, perhaps, our steady patrons would complain because the voices were not pleasant."

In the United States there are upward of 20,000,000 families and at least 5,000,000 places of business, making a total of 25,000,000 opportunities to place telephones. Of these about one-eighth are now equipped.

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

TRUTHFUL ❧ FEARLESS ❧ INDEPENDENT

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CHICAGO, AUGUST, 1904.

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TREATMENT OF TELEPHONE OPERATORS.

AT THE recent convention of the Indiana Independent Telephone Association, held at Lafayette, Indiana, Colonel A. L. Tetu, general manager of the Home Telephone Company of Louisville, Kentucky, was very much in evidence and was one of the moving spirits in all the deliberations of the gathering, serious and otherwise. This genial Kentucky gentleman not only gave his brother telephonists the benefit of his experiences in the operating field by taking part in all the discussions, but both on the rostrum and off he vigorously championed the cause of the telephone operator and impressed it upon the convention in the strongest language at his command that the hard-working "hello girl" is the most valuable asset that a telephone company possesses; that she should be treated with all consideration and respect by telephone managers and protected under all circumstances; that she is human, and should be shown the utmost kindness, as due her sex and trying position. This plea made by Colonel Tetu on behalf of the telephone operator was not a part of the programme. He introduced the subject himself, having been called upon for a "talk," and his earnest entreaty and words of praise for the "hello girl" brought a storm of applause from his hearers, evidently striking a responsive chord. He said on this point:

> The most important thing in making a successful telephone company, next to first-class equipment, is first-class operators. The girls can make you or they can break you. We must have good telephone operators. A telephone man must have regard for the telephone girl—the barometer of his success. The girl is not there because she finds it a pleasure, but because she has to work. And any subscriber who abuses a telephone girl at the other end of the line, for no sufficient cause, is a brute, and not worthy of a place among white men; and a telephone manager who will not rip out the telephone of that subscriber does not deserve success. If I do no better than to aid the crusade for the demand for kind words for the telephone girl, I will consider my visit well worth the while. Let us all get together and make the life of the "hello girl" pleasant instead of full of misery. She is our stock in trade. Kindness shown to the operators will repay the telephone manager a hundred fold.

And Colonel Tetu is right. TELEPHONY fully agrees with him in his views on the treatment that should be accorded the telephone operator. As we have stated before in these columns—and we repeat the assertion again with added emphasis: "There is only one thing in the world more sublime than Christian charity, and that is, the patience of a 'hello girl.'" One who has never been an operator knows little of the exactions and vicissitudes of that position. In a day spent at the switchboard one comes in contact with more phases of human nature, agreeable and otherwise, than anywhere else in the world; and the girl who, day after day, sits in the central office and, in the face of the rebuffs and wrangling of atrabilious patrons of the exchange, retains her composure and an unruffled temper, is as much of a martyr as Job ever was.

There are hundreds of telephone exchanges throughout the country that are filled with just such girls as this, who are forced to become targets for the "slings and arrows of outrageous fortune," in the shape of complaining and grouchy patrons, and must never raise their voices in protest. They are too little appreciated, more's the pity, and if there were more managers like Colonel Tetu, better results would be achieved in the service of exchanges where now there is friction and dissatisfaction, for kindness and consideration shown the operators cannot help but bear fruit in the form of an improved service and harmony in the ranks of the girls.

Along this same line it is a pleasure to note that the Home Telephone Company of Kansas City realizes the true worth of its telephone operators, and that they should be shown every kindness and surrounded with every conveni-

ence, experience having demonstrated to the company that treatment of this sort accorded its operators brings favorable results in a hundred different ways and is moreover an incentive for the girls to put forth their very best efforts to please their employers and the patrons of the company.

In speaking of the methods employed by this company in handling its large force of girl employes, O. C. Snyder, vice-president and general manager of the system, said:

"I suppose the plan has its humanitarian side, but it is also a good business investment. Give your employes a pleasant and comfortable place in which to work, treat them with consideration and the results will more than repay for the trouble."

An hour's watching of the working of the big and busy plant bore out the truth of Mr. Snyder's assertion. Corporations—that is to say, a few of them—seem to have solved the problem of adjusting amicable relations between employer and employe better than individuals, and the Home Telephone Company is one of them.

There are 125 girls employed in the main exchange, others applying for places and no resignations on file. It would be hard to convince the average matron who has her troubles in keeping "help" that such a state of affairs could exist, but it is true, and the society woman who is beset with the "help" perplexity could get some valuable pointers by visiting the Home company's office. Not that telephone girls are on the grade with housemaids—not by any means—but human nature is pretty much the same in all grades.

There is no doubt that the good service furnished by the Home company is partly due to the fact that it gets a glad and willing service from its employes. The girls are not overworked in point of hours, and are paid for the time in which they are eating their lunches or are resting from their work. This is something of an innovation, as similar enterprises have in the main followed the rule of paying the girls only for the time spent in actual work. "We don't lose anything by it," said Mr. Snyder. "It all conduces to better work, more satisfaction on the part of the public, and consequently more telephones."

A noticeable feature on entering the big operating room is the diversity in the dress of the girls at the switchboard. "I don't believe in uniforms," said Mrs. Henrietta Brown, chief operator, "they detract from the individuality of the wearers. Girls resent them, and it really makes no difference whether or not their reasons are good ones. That they do resent them is sufficient proof that they will do better work if allowed to dress in their own way. An agreeable frame of mind is a prerequisite of good work."

Another feature wherein the Home has made a decided improvement is in the elimination of the breastplates supporting the transmitters for the girls' use. These were not particularly heavy, but the wearers testified that they did not grow any lighter after several hours' wearing and physicians attributed many cases of pulmonary troubles to their use. Then, too, they partook of the character of "harness," and this was distasteful. So the Home has never used them, and instead each girl's transmitter hangs in front of her, suspended by cords, and can be raised or lowered at will.

The room in which the "hello girls" work is a model of convenience. It is on the top floor, lighted from all sides and from artistically decorated skylights in the roof. The ventilation is the best that can be devised. Electric fans keep the atmosphere in motion and the air is constantly changing, being continually sucked out through registers in the floor and replaced by pure air from above.

There is a large and well furnished lounging room where the girls who are not on duty gather. The furniture is of the best and the tables are covered with magazines, newspapers and other reading matter. In the cloak room every girl has a separate locker, not a dinky shelf, but a roomy space where coats and hats can be hung up without "mussing."

The girls bring their own lunches, and the company furnishes the china, table linen, coffee, tea, sugar and cream. The china is of such a grade that the company feels sure that not one of the girls finds any better in her own home. The dining room is large and airy and the girls no doubt get an additional zest from their meals in the reflection that they are being paid for this time just as if they were at the switchboard.

Another innovation of the Home company is the hospital room, where a clean, white bed awaits any one who may possibly suffer an accident or be suddenly taken sick. It is seldom used, for the young women employed by the company are an unusually healthy lot, but a hospital room in a telephone exchange is like a revolver in Texas—it isn't often needed, but when it is the demand is sudden and imperative. Then, too, the knowledge that it is there keeps many from feeling the need of it. That may not be good logic, but it is human nature.

THE LIFE OF BUSINESS.

THE sage who said, "Competition is the life of trade," should have further added that *"Advertising is the life of business,"* which statement would undoubtedly have immortalized him. And in this connection it is a well established fact—an incontrovertible truth—that the more of this "life" a man injects into his business, the greater will be the measure of his success in the industrial world. In this day advertising is as essential to the success of any business venture, great or small, as food and drink are in sustraining life. A human being may get along for a brief period with little or nothing to quench his thirst or satisfy his hunger, and the manufacturer or merchant likewise may do business for a time—perhaps—without advertising, but in each case it is only a question of days and weeks when the "fast" will bring dissolution. This is the history and law of business, as well as physical life, and the man who does not recognize this fact is short-sighted, if not lacking entirely in breadth of commercial thought and business acumen. He is behind the times. He will sooner or later be among the failures. This, too, is the history of trade; it is simply the inevitable process of business logic and evolution, and every reader of this article has seen it exemplified a thousand times in the business world around him.

"A drop of ink makes millions think" and the more assiduously this "drop of ink" is fostered and emblazoned in the public eye, just to that extent will the goddess of fortune smile upon the tradesman who thus wisely gives his goods publicity. And the advertiser should keep everlastingly at it, in season and out. Intermittent advertising, while generally productive of good results, will not bring the rich returns that constant, faithful, intelligent, well directed effort will. If the bee worked one week and laid off the next during the summer months when the world is all abloom, it would have a rather unsatisfactory harvest of honey in the fall. The comparison as relates to advertising is so obvious that comment is unnecessary.

In no kind of business in the world do these facts bearing upon advertising apply with more force than in the telephone trade and its kindred branches. Look over the list of telephone manufacturers to-day and who are the leaders? Who have achieved the most success? Who are the best known? In every instance it will be found that the concerns that have been the most liberal users of printer's ink and which have never let up in the good work are the winners in the race for business.

Advertise if you would succeed in business, no matter what that business may be. Try to get out of the beaten paths. Be original if possible, for originality in advertising arrests attention, and it is the attention of the reading public that the advertiser wants. Get a man interested in your product and you have driven in the opening wedge to making him a customer. Appeal to the common sense of the reader. Study your own mind in this particular, as what will appeal to and make a favorable impression upon you will, nine times out of ten, arouse the interest of the readers of TELEPHONY.

If you are a new advertiser and do not secure the proper results from your first advertisement, do not be discouraged and condemn advertising. *Keep hammering away until you do achieve results.* Before a man can harvest a crop he must first sow the seed. You would not expect to plant a kernel of corn and have a sufficient crop for all your wants. No more will the wise man expect that one or two advertisements will cause his name and product to become household words and move customers to stampede to buy his goods. *The key to advertising success, as we have previously stated, is in keeping everlastingly at it.* Blow your horn whenever and wherever you can get a hearer; let your light shine day and night.

If you would be a success as an advertiser and achieve the best results never fall asleep at the switch as the train of opportunity comes your way. Do not pull down your sign and drop out of sight just because business is a little dull. In the so-called "dull season" is just the time above all others that *you do want to and should advertise.*

If your business is torpid, *advertise;* if you want new customers, *advertise;* if you wish to successfully meet competition, *advertise;* if you desire to win fame, trade and dollars, *advertise;* if you would insure your business ship arriving safely in port, *advertise. Advertise always,* and with what degree and judgment you advertise, just to that extent shall your success be measured.

These are not mere words. It is a plain statement of facts, gleaned from the book of experience that has been written by thousands upon thousands of great and small dealers, from the village merchant to the captain of industry. Again we say—*Advertising is the life of business.*

As relating to this important subject the words of Henry A. Barnhart, president of the Inter-State Independent Telephone Association, at the recent Indiana convention are exceedingly apropos and hit the nail squarely on the head. Mr. Barnhart said:

If people could only remember, or be considerate enough to stay convinced, or did not need to be told and shown, or did not like to be coaxed by attractions; or were constitutionally disposed to stand still; or were not everlastingly "looking 'round" for something better and cheaper, there would be no necessity for traveling salesmen and advertisement writers. John Wanamaker would not be rich, and I would not be here preaching the wholesome gospel of "he who bloweth not his own horn, for him it shall not be blown."

Away back in the days when a certain prophetic citizen, named Noah, wanted passengers for his ship, he publicly advertised that he would sail on a certain day, and all who did not get aboard would get left. You know what happened to the multitude who said, "it's only an advertisement." And it has been happening to their kind, in a commercial way, ever since.

Whether or not Noah's Ark sailing advertisement was the first, we know that advertising has grown from year to year until the success of every undertaking which depends upon public interest—be it politics, religion or business, must have judicious advertising for its basis. This is a busy age, and people have little time to hunt for what they want, and most of them have grown into the habit of going directly to the advertising columns of newspapers and other periodicals to find what they need and where to go to get it.

For instance, why do we all go to Kentucky for our morning eye-openers, to Battle Creek for our breakfasts, and to Milwaukee for our afternoon sociability? Is it because their brands are so much better than others; and if so, how did the millions find it out?

The answer is very easy. Their manufacturers have "blown their own horns" and let the world know they have the goods.

And they have not trusted it to the mere announcement that they had good things. They have kept everlastingly at it, and when an old one who has been thoroughly and sufficiently convinced passes away, his successor is educated up to the fact that he gets his health from Battle Creek, his warmth from Louisville, and his self-sufficiency from Milwaukee.

But I need not elucidate further. You are all business men and you know how it is yourselves.

And just here, I apprehend you are plying me with the mental query, how much shall we advertise and what good will it do? As to how much, that depends on your ability and the possibilities that surround you. The customs of communities vary greatly.

First, it is important that we be fully acquainted with our community and the reach of our directors' backbone. If we want to do a telephone business as a side issue to other vocations, for the good of the community, or just to show some other fellow how easily and cheaply a telephone plant will do things, it would possibly be permissible to let the business run itself, advertise itself, and eventually "bump" itself. But if we would make it successful, it must be wormed into the hearts of the people by merit and enterprise.

In the telephone manufacturing industry there are names of manufacturers and apparatus which are, so to speak, household words with us operators. And we buy, generally speaking, that with which we are most familiar. And we are usually most familiar with that which is presented most frequently to us. Therefore, if we are induced to patronize certain manufacturers most because we see and read most of them and the merits of their products, the importance of our making the general public familiar with the telephone service we give must be equally apparent.

THAT $20,000,000 BELL TELEPHONE "TRUST."

THERE is going the rounds of the press at present a weird tale to the effect that the American Telephone and Telegraph Company (the parent Bell concern) has appropriated $20,000,000 to buy up or crush every important Independent company that threatens successful competition with its systems. The story was first launched about the middle of July, and the principal thing in connection with it is its numerous glaring misstatements. There is good reason to believe that the tale was originated by the Bell company. It has all the earmarks of a Bell move to injure Independent securities, if possible, but like all the rest of the Bell plotting of this sort, it will ignominiously fail of its purpose and ultimately prove a boomerang, as have so many other questionable tactics that the Bell company has employed against the Independents, only to be exposed again and again and held up to the scorn of the public.

The alleged $20,000,000 Bell "trust" is explained in the $20,000,000 loan which the American Telephone and Telegraph Company secured from the banks last April for the purpose of overhauling its antiquated systems in the middle west—the Central Union territory—and making other badly needed improvements elsewhere. It was well understood at the time that the stockholders of the Bell company refused to stand for another assessment, having been called upon for contributions of this sort so often that they finally rebelled and the Bell concern was forced for the first time in its corporate existence to go to the bankers for a straight loan at a comparatively high rate of interest, giving its notes for three years and later placing these notes on sale. It is interesting to contemplate what step the Bell company will take when these notes become due. It may foolishly imagine that its $20,000,000 will pull it together again and give it control in the middle west. It will not, however, be able to buy the leading Independent companies of Illinois, Indiana, Michigan and Ohio, nor will it be able to even hold its own in the states named, as the Independent movement everywhere grows stronger as time develops its usefulness to the people. It is this marvelous growth of the Independents that has driven the Bell people to desperation. They have seen Independent companies springing up like mushrooms, north, west, east and south. The Bell has practically been driven out of hundreds of cities and towns, where for years it gave miserable service through the medium of out-of-date

apparatus, laughing at all complaints and implorations for better service and fair treatment. It was this very thing—this utter disregard of the wishes of its patrons—that proved the company's undoing.

With the expiration of the Bell patents came the Independents into the field, and where seven years ago the Bell had a monopoly of the telephone business and the Independent movement was practically unknown, to-day it stands head and shoulders above the Bell company in power and progressiveness, and by their energy the Independents have forced this would-be monopoly from pillar to post until now it is at the edge of the last ditch. To rout the Independents from the four states previously mentioned will take more money than the American Telephone and Telegraph Company can ever raise, because the Independent movement is a crusade founded upon a God-given principle, which gold cannot buy.

THE TELAGIRL SYSTEM.

CLEVELAND man, E. C. Riegel, has inaugurated an unique new business enterprise in that city, which opens up an entirely new field for the development of the telephone industry as applied to everyday business affairs. He calls his system "Telagirl," and it consists of a plan by which business men may dictate their correspondence to a stenographer in the office of a concern by telephone, and the work is done and sent back to the office of the subscriber—a saving of both time and expense to the average business man. Private telephones are installed at the desk of each subscriber, without expense, and enough stenographers are employed to take care of his work at any time he may call.

The stenographer takes his dictation either by notes or on the typewriter as preferred, using his personal stationery, which is, of course, kept on file. The finished work is then enclosed, without folding, in a large envelope, sealed and delivered at once by prompt messenger service. The monthly statements rendered to clients of the company are of particular value, as they are itemized in every detail, thus forming a valuable reference index of correspondence to the business man. The completest privacy is secured, each stenographer having a small room of her own so that messages can be repeated back to the client without being overheard by others.

In addition, a business man who has no one to leave in the office may have his telephone connected up with the "Telagirl" office when he steps out, inform the girls when he will be back and leave instructions for anyone who may call him up. In that way all inquiries will be answered and the new concern will take the place of an office girl. Arrangements will also be made to take care of business at night, on Sunday and at other odd times when employes of all offices are out. Graphophones will also be installed in the offices of those who desire and records of dictation will be called for by messenger.

So far as known, this is the only system of the kind in this country. The charges will be moderate and it is probable that the service will be broadened from time to time to take in other branches. It is a novel enterprise, to be sure, and there seems to be no apparent reason why it will not work as well in practice as in theory. It certainly has points about it that appeal at once to the business man with whom time is money, and with whom also the saving of the former means the annexing of still more of the latter. With these captains of industry, in particular, the Telagirl system should prove extremely popular.

IOWA'S NEW TELEPHONE LAW.

IOWA has long been known as one of the most progressive, enterprising states in the Union, and its attitude in the regulation of public utilities is one that should be patterned after by every other state in the Union. The last general assembly of Iowa passed a law relating to telephony, which has many excellent features. This measure provides that every telephone and telegraph company in that state must hereafter furnish a correct map of its lines and annually revise the same. The text of the new law is as follows:

Be it enacted by the General Assembly of the State of Iowa:

Section 1. That on or before the first day of August, A. D. 1904, each telephone or telegraph company owning or operating a telephone or telegraph line, any part of which lies within the State of Iowa, shall file with the several county auditors of the counties within which any part of its line is located, a map of all its lines within said county, except its line within any platted city or town, drawn to a scale of not less than one (1) inch to four (4) miles, on which the location of the line or lines of said company is correctly shown. The map of any line situated upon any highway or street which is the dividing line between taxing districts shall show on which side of said street or highway said line is situated and shall locate all points at which said line may cross said street or highway. A statement showing the length of pole line in each taxing district, of each company, shall be filed when no map of the pole lines of such company is required under the terms of this act. A telephone or telegraph company whose line is situated upon the right of a railway may file, in lieu of the map required to be filed by the provisions of this section, a certificate setting forth along what lines of railway said company's telephone or telegraph line extends. On or before the first day of March, A. D. 1905, and annually thereafter, like maps, statements or certificates shall be filed with the several county auditors of counties in which any part of said lines may have been extended, constructed, relocated or taken down entirely, during the preceding calendar year, showing the correct location of all such new or relocated lines, and the location of any part abandoned or taken down as the same existed on the thirty-first day of December preceding. Provided, county auditors of the several counties shall, upon application of any company, owning or operating a telephone or telegraph line in their respective counties, furnish a map or maps accurately showing the boundaries of all taxing districts in said county, and the public highways located within such taxing districts.

Sec. 2. In the event of the failure or refusal of any telephone or telegraph company, owning or operating any telephone or telegraph line not situated upon the right of way of a railway, to file the map required under the provisions of section one (1) of this act, at the time and according to the conditions named, then the county auditor may cause the same to be prepared by the county surveyor and the cost thereof shall, in the first place, be audited and paid by the board of supervisors of the county, out of the county fund, and the amount thereof shall be by said board levied as a special tax against said company and the property of said company, which shall be collected in the same manner as county taxes and become a part of the county fund.

"BUSY."

TWENTY-FIVE years' experience in the use of the telephone has not taught the public that it is a great mistake to suppose that an operator says the called line is busy because she is too indolent to find out whether it is or not. After such a lapse of time it is probably useless to hope that the constantly increasing telephone public ever can be educated to know that it is quite out of the question to believe that the operator really would far rather make the connection than reoprt a "busy." Because of this and because the very best service is that in which no busy report is ever given, a greater watchfulness and care than is usually practiced would seem to be highly important.

Naturally enough a growth in party line development has resulted in the public mistaking a report of a busy line for a report of a busy station, and instances continually arise in which the disgruntled subscriber complains that he called his friend in a neighboring office, was told the party was busy, and on immediately visiting this friend he found he had not used the telephone for half an hour.

No one is at fault in such a case, but that is hard to believe, even when the facts are carefully explained.

A more prolific cause of busy reports is the fact that certain lines in any exchange are really far busier than should be permitted, and are attempting to carry a traffic for which they are not capable. The experiment of keeping accurate records of in and out calls on the busiest lines, tabulating the results, and waiting upon the patron with the figures, in an effort to get from him contracts for more service, will produce results which are ordinarily most surprising. In certain exchanges of but a few thousand subscribers, the increase in annual income resulting from a short, consistent canvass of this kind has been several thousand dollars.

TELEPHONE CONSISTENCY.

CONSISTENCY is said to be a virtue, and there is no doubt that within a reasonable definition of the term there is much to be admired in keeping of the same mind on an important subject. In such old industries as banking and general merchandising, it is to be expected that so nearly all of the fundamental truths have been found out that a consistent policy may be outlined by a wise man, and that it is wisest for him to keep along its lines In the newer arts it would seem abstractly more likely that a policy seeming consistent today might be inconsistent at a later time. We can recall when it was said to be impossible to put telephone wires underground, and when the proof of it seemed to be convincing; we can remember when it seemed likely that all the electric traction lines must use two trolley wires because of the serious interference with telephone service of using only one; more lately we can notice a change of feeling with reference to the former claim of the absolute impracticability of party lines, measured service, and various forms of construction and equipment.

One of the most aggressive development pioneers in the telephone business is frequently quoted as saying, "The difference between a man and a donkey is that a man can change his mind." While to jump from notion to notion, merely in the hope of getting a new thrill from the novelty of a new situation is an attribute of boyishness rather than of manliness, it is not to be denied and must never be overlooked that in a rapidly developing art every claim presented by a new situation should be investigated with painstaking care, rather in the hope of avoiding the inconsistency of too great conservatism, than of avoiding the accusation of the inconsistency of being changeable.

Another wise man of the first generation of telephone men has said that there is only one road to success in the business, and that is "find out the best way and then do that way." In the face of a multiude of important things not thoroughly investigated, it would seem to be a plain duty always to face the situation with a desire to find out all of the truth there is in it, and having done so to draw the sanest possible conclusions from that truth without regard to whether or not some of our previous notions are likely to be upset.

PHILANTHROPIC USES OF THE TELEPHONE.

A GREAT deal of interest has been awakened by the announcement of the use of the telephone recently in one of the largest churches in Philadelphia, in order to enable the inmates of a certain hospital to share in the services. This utilization of a modern invention for the brightening of the lives of suffering ones and for their spiritual uplift appeals to the popular imagination. It is a consecration of the achievements of science.

Doubtless it has suggested to many fertile minds other philanthropic uses for the telephone. Report has erred in stating that this occasion is the first in which the telephone had been similarly used in a church in this country. Six or seven years ago visitors to the First Presbyterian Church of Chester, Pennsylvania, were surprised to find in one of the pews a big horn, and to be told that it was simply a large telephone receiver, connected with the sick room of a confirmed invalid who was a member of the church, and who, by this means, participated in all of its regular Sunday and mid-week services. The Christian Endeavor Society, of which the young woman was a member, had installed a telephone in her home and in the church. Thus she was kept in closest touch with the life and work of the congregation. More than that, by means of the telephone at her bedside, she was "visited" many times during the day by her young friends, who were clerks in stores and offices, and her lonely life was thus varied and brightened to a wonderful degree.

There are thousands of such invalids who could be brought into touch with a wide circle of life by the installation of a telephone at their bedside. The sick room would be robbed of much of its gloom and loneliness by such a means. In this day, when the use of the telephone has become so general, the invalid's visiting list would be the telephone directory. The suggestion is one that should appeal to all families with invalid members, and equally so to religious and fraternal organizations with members who, by disability, have been shut apart from personal touch with their kind.

As to the use of the telephone in hospitals, it is to be hoped that the experiment which was found so practicable and so successful in the case of one may be extended almost indefinitely, so that every large church may count among its congregation the patients in at least one hospital. This is the twentieth century, and for twentieth century service twentieth century methods should be adopted.

UNDERGROUND CABLES STAND FIRE TEST.

The Baltimore fire, says the *Electrical Review,* has been the unfortunate means of settling many disputed points for the engineers of this country, and it has, among other points, emphasized most forcibly, in the minds of the interested observers, the superiority of underground cables for electrical transmission of power, as compared with old overhead methods.

During the past few years many miles of "standard" underground cable were installed in Baltimore, in the municipal subway for the Western Union and Baltimore & Ohio telegraph companies, the Maryland Telephone Company, the city fire and police departments and the United Railways and Electric Company. The main conduit lines run the entire length of the burned district and the manhole covers were in many cases covered with piles of hot brick and stone to a depth of twenty feet.

In spite of the intense heat, there is, so far as is known, not a single instance of trouble on the cables in manholes or subway except where exposed ends of cables were destroyed by fire, and the cable system is in perfect condition to-day.

Two three-conductor cables installed for the United Railways and Electric Company over a year ago and which terminated in the new and unburned portion of the Pratt street power-house, extended the entire length of the burned district, and were carrying current to the substation at 13,000 volts, the second day after the fire, without any interruption to service.

Exploitation of the telephone is carrying it into the parlor, the dining room, kitchen, bathroom and bedroom. In the latter place the little receiver may assist in distributing a great deal of snore that now goes to waste.

Prosperous New York State Company

SO MUCH has been published regarding the progress made in the Independent telephone field by the companies in the western states, that it will be of interest to know what is going on in New York state. In central New York, close to the foothills of the Adirondacks, are the twin glove cities of Gloversville and Johnstown, and here, surrounded by a semi-mountainous country, with some of the most beautiful scenery for which this section is famous, are situated these two hustling glove cities. This is the section the Glen Telephone Company has occupied with a good measure of success.

The company was organized in 1899, and the following year secured franchises in the above cities and surrounding villages. During the summer of 1900 a conduit system was put down in Johnstown, and in February, 1901, their Johnstown office was opened with 500 telephones in use, which was more than double the number previously used there. Gloversville was next installed, and opened for business in May, 1901, with a switchboard equipped for 1,000. The demand for telephones in this city has been phenomenal, and now, when operating nearly 1,600 telephones, the company is busy enlarging its switchboard to take care of 400 more. Gloversville people are accredited with being "telephone crazy," and it is easy to believe that there will be a demand for over 2,000 telephones in this busy city of 18,000, or telephones for twelve per cent of the population.

The appartus used is the Stromberg-Carlson central-energy system.

In February, 1903, through some cause the exchange at Johnstown, which was operating over 600 telephones, caught fire in the store room, and was almost totally destroyed, the switchboard being a total loss. The company held a meeting the next morning, and in ten days from that date a complete new Stromberg-Carlson lamp signal board of 3,200 capacity, with 1,080 lines equipped, was received by express, and in sixty days the system was again in working order. In the meantime a large number of business houses were at once connected up with the Gloversville office, four miles distant, and were thus but a day or two out of service. This accomplishment of rebuilding and installing a new outfit in two months speaks volumes for the switchboard company in showing their ability to deal with large problems in a thorough and efficient manner, and it shows, as well, the faith the Glen Telephone Company have in the business.

The Glen company has taken pains not to overlook the small villages, and have fine exchanges installed in Northville, Broadalbin, Fonda, Fultonville and Glen. These exchanges give service to the villages; a large number of farmers have been given service and more will be taken care of as soon as lines can be built.

When the plans were made to install the twin glove cities, a capacity of double the old company was arranged for, but the first year showed they had miscalculated, and ever since that time the company has been busy enlarging their switchboards or placing new cables and lines. The Johnstown switchboard embodies all the late features in a lamp signal multiple board. This plant is visited by representatives of companies, who desire to equip cities of about this size (10,000 inhabitants), and without exception they express themselves as being highly pleased.

INTERIOR AND EXTERIOR VIEWS OF JOHNSTOWN (N. Y.) EXCHANGE BEFORE AND AFTER FIRE.

The Glen Telephone Company is now operating 1,575 telephones in Gloversville and 780 in Johnstown, and has a large number of unfilled orders, which it will take care of during the summer.

J. S. G. Edwards is president and general manager; Charles B. Knox is vice-president; Edward S. Parkhurst, secretary, and Howard A. De Graff, treasurer.

HEARD ON THE PARTY LINE.

BAD TELEPHONE MANNERS.

A dignified matron who has a couple of debutantes in her family complained the other day that the telephone was conducive to bad manners, reports the Chicago *Tribune*.

"I do not think I can be accused of being unprogressive," she said, "but I never shall become accustomed to telephone manners. This is what happens to me about every hour in the day:

"Telephone bell rings. I, being convenient, answer. Masculine voice calls 'Hello.' Now I realize that the possessor of that voice is probably a youth of 20, and while I resent the familiar 'Hello' I respond, 'Hello,' and he begins:

"'Who is this?'

"'Who is this?' There is something so abrupt in this form of question that I feel like making an explanation that will not only be considered satisfactory but final, but having identified myself to the young man's satisfaction he proceeds:

"'Oh, this is Mrs. B.! Well, Mrs. B., I want to see Miss H. Will you tell Miss H. I want to speak to her?'

"He does not apologize, seldom says 'Thank you,' and never by accident says 'Please,' and allows me to hunt all over the house for the one he wants; sometimes grows impudent when I can't find her, and seems to ignore the rights of everyone but himself."

HER WIFELY SOLICITUDE.

They had just telephoned from downtown that hubby was seriously injured and was fast losing consciousness.

The poor wife was distracted.

Grief, perplexity, exasperation, were on her face.

At last she gasped into the mouthpiece of the telephone.

"I suspect I cannot get down there in time, for my new hat hasn't come from the milliner's yet. But if I can't, please ask him, before he loses consciousness, what he did with the theater tickets for to-night."

And then, her grief obtaining mastery, she fell in a dead faint.—*Baltimore American.*

BEES FOR SALE CHEAP.

"Did you ever handle bees?" asked Colonel Salisbury, a genial agent of the Nebraska Telephone company, of a number of citizens. "We have 'em for sale," said the colonel, "two hives of them, warranted to be lively and full of ginger. They have taken possession of two of our cable boxes, and insist upon roosting there, so that it is impossible for the linemen to do their work."

Local Manager Ryner admitted that he was "buffaloed." Mr. Ryner said that was the best way he could express it, for in any event the bees were in possession of two strong positions, and insisted upon remaining there.

In vain did Manager Ryner and Colonel Salisbury endeavor to sell or give the bees away. "I have handled bees plenty of times," said one man, "but I never tried it forty feet above the ground. I should much prefer to be in a position to run before taking possession of two hives of bees."

Meantime the telephone men talk of smoking the bees out. There they are. One set of bees at Twenty-fourth and I and another at Twenty-fourth and G streets. The moment a lineman commences to ascend the pole, the bees arise and make an attack upon him. One of the men was severely stung recently, before he had ascended ten feet, and, concluding that discretion and horse sense were the better part of valor, he made a flying leap for terra firma.—*Omaha World-Herald*

THOUGHT BOOTH AN ELEVATOR.

Everything was peaceful at the Northwestern Telephone company's building, on Fifth street. Several employes were standing near the auditor's door in the downstairs hallway, when an elderly gentleman, with a neatly trimmed beard, walked briskly in the front door, through the hallway and into the telephone booth at the foot of the stairs. As he stepped inside he said in a loud and cheery voice: "Going up!" There was "nothing doing," and the man who wanted to ascend looked curiously around the booth and back into the hallway, only to see a group of young men convulsed with laughter. The absent-minded man made a quick "get away."—*Minneapolis Times.*

RILEY'S TELEPHONE INTERVIEW.

A friend of James Whitcomb Riley tells a story of an encounter the bachelor poet once had in Louisville with a woman reporter. The energetic young woman, after strenuous effort, had finally caught Mr. Riley at the telephone. This is the conversation that followed:

"Is this Mr. Riley?"

"Yes. This is Miss—"

"Miss Jones of the *Courier Journal.* I've been trying all day to get an interview with you, Mr. Riley."

"Ah, would it were now a view instead of an interview," said the poet gallantly.

"Oh, thanks. How long will you remain in Louisville, Mr. Riley?"

"Only a short time."

"Is your wife with you?"

"No, ma'am, she is not."

"Where is she, may I ask."

"You may ask, my dear Miss Jones, but I find it very difficult to answer. I am in absolute ignorance as to her whereabouts. For aught I know to the contrary, she might now be at the other end of this telephone!"

There was much laughter and afterward an effort to resume the interview. But in vain. Mr. Riley had escaped.

TELEPHONE WAS STOPPED UP.

Employed on Dr. A. V. Banes' country place, northeast of the city, is a Swede whom the doctor calls Ole Oleson. The other day Doctor Banes said to Olson:

"Ole, you better learn to use that telephone right away. The bulldog might get sick out here some day, and you'd want to send for me in a hurry. Now, I'll show you how it's done."

The hired man was given an object lesson in the use of the instrument, and then was told to do it himself.

After mistaking the received for the transmitter, after central had rung in his ear, and he had heard someone saying, "Get 'em, get 'em, get 'em?" Ole grumbled:

"Must t'ink Aye bane drinkin' too mooch skalkahal!"

But he persevered, ringing the bell as though he were grinding coffee. It is supposed that a jumble of confused and muffled sounds must have come to him over the wire, for he removed the transmitter from his ear, spit into it, wiped it on his blouse, and muttered: "Hay bane shtuffed oop!"

It is said that the instrument has worked first rate since then.—*St. Joseph (Mo) News-Press.*

Telephone lines are being constructed with wonderful rapidity in Northern Kansas. Five years ago there was not a hundred miles of rural telephone lines in Northern Kansas. The mileage now runs into the tens of thousands.

Popular Chief Telephone Operator

KENTUCKY is noted for the homage it pays to the fair sex, this admiration of the "eternal feminine" often taking unique forms of expressing itself. There have been beauty contests in the Blue Grass state too numerous to mention, but nothing of this character has attracted more attention or is developing a sharper rivalry than the contest recently inaugurated by the Louisville *Evening Times* for the most popular business woman in Louisville, New Albany or Jeffersonville. The voting in this novel contest began on June 1 and will continue until September 3, when prizes will be awarded the fortunate ones. Already nearly a million votes have been cast (each new subscriber to the paper being alloted a certain number according to the amount paid in), and interest in the struggle is daily increasing and spreading out over the state.

The first prize consists of a $400 Kurtzman piano and a $250 pianola and $50 worth of music for the pianola. The second prize is a $300 piano, and the third prize is $200 in gold. The value of the prizes has made the contest very exciting, there being upwards of fifty-six contestants to date. In addition to the head prizes the *Times* announces the offer of additional prizes aggregating $200, to be divided into eight consolation prizes of $25 each, to be given to the eight young women, with the exception of the three leaders, having the largest number of votes, thus making eleven prizes for popular business women. Then each week the *Times* distributes prizes in gold to the three contestants securing the greatest number of votes.

MISS MARIE YONKERS.

In view of the great popularity of the Home Telephone Company of Louisville, of which Col. A. L. Tetu is general manager, it was fitting and proper that that organization should have a representative in the contest, the honor falling to Miss Marie Yonkers, the beautiful and highly efficient chief operator of the Home Company, an excellent likeness of whom is printed in connection with this article. That both Miss Yonkers and the Home Company are favorites with the Louisville public is shown by the thousands upon thousands of votes which she has already received and the great interest that is being shown in her candidacy. At present Miss Yonkers stands third in the list of candidates with a total of over 90,000 votes, the leader in the contest having 130,918 to her credit. However, Miss Yonkers' friends are active and believe they will succeed in landing first prize for her, and it is generally conceded that she will at least succeed in winning one of the coveted prizes.

If any one thing more than another has aided Miss Yonkers in this contest it is the popularity to which the service furnished by Home Company has attained under the able management of Col. Tetu; and the uniform courtesy accorded the telephone using public of Louisville by the operators is due in a large measure to the efforts of Miss Yonkers and to the excellent discipline she maintains among the young ladies in her department. The patrons of the Home Company evidently realize this and give her credit for the excellence of the service. As an evidence of what this means it is only necessary to state that, exclusive of Sundays and based upon the figures of the Home Telephone Company's monthly peg count, during each of the three months of April, May and June a total of 9,000,000 calls were answered by the operators—an average of 3,000,000 a month. Complaints of operators' faults during this period were as follows: April, 27; May, 15; June, 20. This is a total of sixty-two complaints registered by patrons of the company out of a total of 9,000,000 calls answered. It is doubtful if there is another company in the country that can show such a record.

In order to insure the maximum of good service on the part of its operators the Home Company distributes $100 a year in prizes—$50 semi-annually—to the five operators with the best records. In this connection the following letter to TELEPHONY from Manager Tetu will be of interest, and fully explains the prize system and its effect in the way of developing perfect service on the part of the operators:

I am giving you herewith the result of our prize service competition for the period during July 1, 1904. You may or may not understand that this company offers $100 a year in prizes, distributed in amounts of $50 semi-annually, to the five girls who show the best records for the preceding six months.

There is not much need of going into it in detail, except insofar as it relates to the winner of the first prize. This young woman, Miss Theresa Dierkes, answered 130 calls, made by our inspectors from subscribers' stations, under the stop watch, each call being answered on an average of 1 8-10 seconds. In addition to this, the young woman not only did not lose one hour during the preceding six months, but did not have a single complaint of any kind registered against her, either from her subscribers or from her supervisors. We consider this a most remarkable record, one that is seldom equaled and never excelled.

During the above-mentioned six months, the total number of tests made was 7,024. The total time required in answering was 16,158 seconds, or an average of 2 3-10 seconds per call. Our prizes are distributed as follows:

First prize	$15.00 in gold.
Second prize	12.50 in gold.
Third prize	10.00 in gold.
Fourth prize	7.50 in gold.
Fifth prize	5.00 in gold.

Knowing that you are interested in data of this kind, I send it to you in the hope of inviting comparison from other exchanges.

This feat of Miss Dierkes' stops little short of the marvelous, and the Home Company should not alone be proud of having such a clever operator in its employ, but should, and doubtless does, feel a just pride in the excellent records made by the other operators in numerous tests. Such wonderful telephone service is brought about by two things—first-class apparatus and construction and perfect operating discipline and service.

The Telephone in Court Circles

Albert and James Clark of Wilkesbarre, Pennsylvania, who were shocked and injured by a live wire, have sued the Pennsylvania Telephone Company for $55,000, declaring they are permanently disfigured.

The Duluth (Minn.) Telephone Company has won the suit brought by the city of Duluth to compel the removal of wires to admit the moving of a building, on the ground that the ordinance as drawn is not valid.

A shock from the receiver of one of the Northwestern company's instruments at St. Paul is the ground upon which Philip Barton sued the company for $2,000 damages in the Ramsey county courts. He was awarded a verdict of $500.

Judge Brennan of Des Moines, Iowa, has rendered a decree in the case of the Iowa Telephone Company against the county treasurer in which he gives a judgment to the telephone company and enjoins the treasurer from further assessment of the company on the exemption claimed.

I. C. Oliver of Center, Texas, has sued the local telephone company for $2,000. Mr. Oliver alleges that the company failed to deliver a message from his wife while in Nacogdoches in regard to a sick child, and when Mr. Oliver did not get the message the child was dead before he reached there.

The first action for damages to be brought in Salt Lake City against the Utah Independent Telephone Company has been brought by Mrs. Laura A. Lynch to recover $25,000 damages alleged to be due for the death of her husband. The Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York, are also made defendants to the action.

Ten more telephone users have appealed to Judge Mack of Chicago to add their names to the list of those protected by the injunction given on petition of the Illinois Manufacturers' Association against the Chicago Telephone Company. The injunction suit is one begun to force lowering of telephone rates in conformity with the city ordinances and to prevent alleged extortion.

Mrs. J. M. Walker, Leon Walker and Mrs. M. E. Griffin of Temple, Georgia, have filed suit against the Southern Bell Telephone Company for $500 damages alleged to have been done their premises by the company in erecting wires and poles over the lands, driving teams over the crops, cutting timber, leaving debris and causing worms to get into and damage nearby timber.

T. Martin Smith, a San Francisco dentist, sued the Pacific States Telephone and Telegraph Company for $5,000 damages recently because his name and telephone number were omitted from the company's last directory of subscribers. He alleges that his business has been injured to that extent, as people supposed he had retired from practice when his name did not appear in the directory.

Some time ago the Maysville (Ky.) Telephone Company refused to grant a telephone service to Dr. G. M. Williams of that city. He tried to compel the company through mandamus proceedings to furnish him with service. Judge Harbeson overruled the petition for mandamus, dismissed the case and gave the telephone company permission to recover its costs. Dr. Williams has appealed the case.

The city of Elgin, Illinois, is preparing for a legal battle with the Chicago Telephone Company. An effort will be made in the courts to compel the Chicago corporation to pay a tax of $1 on each telephone in use in Elgin. If the Illinois city wins its suit it probably will mean attempts in other cities to make the Chicago corporation pay a tax on its instruments. The telephone company will put up a hard fight.

The Farmers' Telephone Company of Hopedale, Illinois, sued the Pekin (Ill.) Telephone Company and secured an injunction restraining the Pekin company from refusing to make connections with their line. The attorneys for the Pekin company argued a motion for a dissolution of the injunction in the Circuit court at Pekin, but Judge Worthington of Peoria overruled the motion and the injunction still remains in force.

Heirs of James Powers of Springfield, Massachusetts, served papers on F. G. Daboll of Springfield, general superintendent of the New England Telephone Company, in an action brought against the company for $5,000 for the death of Powers, June 12, 1903. Powers went to the residence of F. E. Pierson in Crofut street to make some repairs to the telephone instrument. There was a crossed wire and he was killed instantly.

The appeal of the Independent Telephone Company of New York city against Robert G. Monroe, as commissioner of water supply, gas and electricity, has been dismissed with costs by the Court of Appeals of Albany. The appeal was from an affirmance of an order denying a writ of peremptory mandamus to compel the defendant commissioner to grant permission to the company to lay its subways under the streets of New York city.

The County of Kenton, Kentucky, the Citizens' Telephone Company and the Independence Telephone Company of Covington have filed suit in Kenton Circuit Court against Sol P. Kineon, Jesse Sheets, Carey Reardon, Robert Welston and the Kineon company. It is claimed that defendants, without right or authority of law, are engaged in constructing a telephone line through Kenton county, whereas said right has been granted to plaintiffs only.

Mrs. Sarah Foley, widow of the late Frank Foley, of Camden, New Jersey, has sued the Eastern Telephone and Telegraph Company for $20,000. This suit is the outcome of an accident which proved fatal to the husband of the plaintiff the latter part of last March. While employes of the telephone company were trimming trees for the purpose of stringing wires along their new line to Atlantic City, Mr. Foley was struck by a falling limb, breaking his back and causing his death.

Jeremiah Riley of East Cambridge, Massachusetts, was given a verdict of $1,500 against the New England Telephone & Telegraph Company, for personal injuries, by Judge Fessenden of Boston. He was thrown from his wagon by one of the hubs coming in contact with a telegraph pole negligently suffered to lean out toward the

roadway in East Cambridge. Riley sued for $6,000, and this was the second trial, the first having resulted adversely to him.

The Supreme court of Ohio has decided that the city of Findlay cannot prevent the Home Telephone Company from raising its rates. The decision was rendered in the case of a subscriber who refused to pay more than the rate fixed in the ordinance, namely, $12 per annum. In delivering the opinion, Judge Day of the Circuit court said that the city had no more right to fix telephone charges than it has to fix the price of groceries, dry goods, or other life commodities. This opinion has been affirmed by the Supreme court.

The Middletown (Ohio) Home Telephone Company, through its attorneys, Charles H. Bosler and Albert Emanuel, has brought suit against the city of Middletown to secure the right to construct, maintain and operate a telephone system in that city. The company made application to the council for an agreement as to manner of using the streets for a telephone system, but a franchise which was unreasonable was granted and the company refused to accept it. The company asks the court to fix the mode under which the streets may be used for its telephone system.

A jury at Buffalo, New York, has awarded Theresa Keily a verdict of $5,300 against the Frontier Telephone Company. The plaintiff is about ten years old. While going home from school and in passing a telephone pole upon which some linemen were working, she was badly injured by being struck by a cross piece which fell upon her, striking her a glancing blow upon her head. Her injuries are said to be of a permanent character. The real defendant is an insurance company which insured the Frontier Telephone Company against the result of actions of this character.

The Martin Telephone Company of Webster City, Iowa, has served notice of suit for $1,000 damages against the Stratford Independent Telephone Company. Five hundred dollars' damages is alleged to be due on a breach of contract and $500 exemplary damages is claimed. The two companies formerly worked together under contract, but the Stratford company recently came under the control of the Hamilton County Independent Company, which compelled the Martin company to remove its wires from its board at Stratford. The Martin company claims this is in violation of the contract, hence the suit for damages.

Unsightly telephone poles caused Emma Graham of Reynoldsburg, Ohio, to come into court and ask for an injunction against the Ohio Telephone and Telegraph Company. The plaintiff is the owner of certain real estate located in that village and the fact that the telephone company constructed a line past the premises without her consent and trimmed and cut the shade trees bordering upon the property, led her to believe that her rights had been infringed upon. She estimated the probable damage to the premises at $600. Judge Bigger, however, held that the grounds for the restraining order were not well taken, and declined to estop the company in its operations.

The Tuscola (Ill.) Telephone Company succeeded in getting the restraining order of the Master in Chancery J. M. Walker dissolved by Judge Philbrick at Urbana, Illinois. The temporary injunction was issued upon the application of the Douglas County Telephone Company, claiming that a certain crossing of the cable of the new company would interfere with and injure the wires of the established service. While the temporary injunction was in force the old company, it was claimed, had run a line through the space that the new company proposed to utilize. Judge Philbrick held that there was no testimony to support the contention that the new cable would injure the service of the Douglas County Telephone Company and dissolved the injunction. He also took the opportunity to criticize the action of the old company in attempting to use the space while the temporary injunction was in force, in order to occupy the disputed air line.

Chancellor Robert Magee of Jackson, Mississippi, has filed with the railroad commission of that state a bill of complaint against the Cumberland Telephone and Telegraph Company. The bill sets forth that up to the beginning of 1899, the Cumberland company had a long-distance telephone in the town of Hazlehurst, while there was a local system in Hazlehurst reaching Jackson, McComb City, Port Gibson, Utica and other points outside of the county, and a local system reaching all over the county, among other places to Browns Wells. The Cumberland company bought out the local system and broke it up. The complaint sets forth that the Cumberland has allowed the line to Browns Wells to get in very bad repair, allowing it to remain that way for weeks, but continuing all the while to collect tolls. When a subscriber threatens to make a complaint the telephone company in turn threatens to cut out the line if they complain. The bill says:

> This course of conduct has been going on for several years, and the people subscribing to the 'phones are getting tired of this kind of intimidation.

The railroad commission is asked to come to the relief of the subscribers and compel the Cumberland company to keep up its lines.

INDEPENDENT COMPANIES ORGANIZE.

The Miami Valley Telephone Association was organized at Piqua, Ohio, recently. The organization is made up of the representatives of the Independent telephone companies in the counties of Montgomery, Miami, Drake, Shelby, Campaign, Clark and Logan. A committee was appointed to nominate officers and report at a meeting to be held in the near future.

General Manager M. B. Oberly of the United States Telephone Company of Cleveland, which controls the long-distance lines in Ohio and adjacent states, was present at the meeting, as was J. S. Brailey of Toledo, representing the Central Construction Company.

These gentlemen assured the telephone men present that it is the intention of their companies to push the work of constructing new lines in that part of the state vigorously, and that in the near future lines will be in operation enabling the local exchanges to afford through service to points in Illinois, Indiana and the west. The first large city to be reached by the proposed extensions will be Kansas City, and the others will follow as rapidly as possible.

The wire is now on the ground, and work will be begun at once on a full copper line from Piqua to Lima, and when this is finished it will give Piqua direct Independent connection with Toledo. New lines will also be started at once from Greenville to Dayton, and between Piqua and Covington, by the local company, while the United States people will construct a cable from Dayton to Richmond, which will bring a number of towns into direct connection with the companies in that part of the state.

The growth of the Independent telephone business in Ohio has been very rapid. The movement only took shape in 1900, and to-day in Miami county alone there are nearly 4,500 Independent telephones in use, located as follows: Piqua, 1,500; Troy, 1,400; Covington, 400; Pleasant Hill, 200; West Milton, 600; Bradford, 350. Other counties report a similar growth.

The Telephone in Foreign Countries

LONELY TELEPHONE LINES.

A BREAK occurred some months ago in the telephone line that extends up the Shire River from the Zambesi to Lake Nyasa, in Africa. In such countries, where there is little civilization, weeks sometimes elapse before accidents to the telephone can be repaired. On this route, however, the stations are only fifty miles apart and the line is usually put in order within three or four days after the break occurs.

Probably the line with the longest distance between repair stations is that which crosses the great Australian desert from Adelaide on the south to Port Darwin on the north side of the continent, 1,700 miles. There are no human inhabitants in the desert, except a few wandering blacks. The stations are about 200 miles apart. At each station there are usually two operators and four line repairers. They have no nearer neighbors than the occupants of the next station, and, of course, the men lead a very lonely life. Whenever a break occurs two men start from either of the stations between which the line has become unworkable. They take with them camels, loaded with food and water, repair implements and a field telephone apparatus. At every ten miles each party taps the wire and communicates with its own station. So each moves on until one or the other finds and repairs the break. Communication being restored, the news is conveyed to the other party and both retrace their steps to their quarters without having seen one another. They very seldom see a white man, except their own comrades.

Many persons have wondered how telephone lines can be protected from barbarous natives through whose territory they pass. This problem has been successfully solved both in Australia and in Africa, though the method in one continent differs from that in the other. When the line was being stretched across Australia it was feared that the blacks would constantly interfere with the wire. The plan adopted has worked like a charm, and the blacks have never touched the wires, though on several occasions they have attacked the stations and killed the operators and repairers.

Every effort was made to fill the savages with awe of the wire. Their nerves and imagination were worked upon by telling every black who was met while the line was being built that the wire was the white fellow's devil and not a single native came within reach who was not treated to a gratuitous electric shock. There is not a black in Australia who is not convinced that the white fellow's devil is something to let severely alone.

In Africa, on the other hand, every chief of the tribes through whose land the telephone lines extend is in the pay of one or another of the colonial governments. He receives a small monthly subsidy, and is held responsible for the wire in his territory. The will of these chiefs is law, and although many hundreds of miles of wire are now extended through various parts of barbarous Africa, only two or three instances have occurred where the natives have interfered with it. In fact, the natives are used to some extent to keep the lines in order.

ABYSSINIAN TELEPHONES.

At the present time there are nearly 800 miles of telephone wires in Abyssinia, and enough more are being stretched to bring the total length to nearly 1,800 miles by the end of this year if nothing happens to stop operations. An American engineer who laid out many of the routes and helped to install the first few hundred miles of wire, under contract with the Abyssinian Minister Jig, who initiated most of these improvements, says:

"There wasn't a thing that weather, man or beast could do to us that wasn't done. Tremendous rainfalls were the first source of damage. The water would literally pour out of the sky, and when the 'shower' was ended we had the pleasure of going over miles of line and resetting poles that had been washed out of their places by young floods.

"Scarcely had we begun to erect the poles before we found that they were falling again, mysteriously, as it seemed. Then we saw that we were up against the termites. As soon as wood was placed into the ground they were at it. You can see acres and acres of land in parts of Abyssinia that are as well cropped as if some one had gone over them with a giant lawn mower. That is the work of the termites.

"Immediately after discovering this we ceased to erect wooden poles and used iron ones. Then man began his work. The natives saw great uses for the beautiful round iron posts, and whenever we had moved on a few miles they would sneak up and tear them out. Finally King Menelik had to send messengers throughout the country proclaiming that extreme punishment awaited any who touched the telephone plant.

"Now that the wires are up and men leaving them alone, there is constant damage still. The monkeys of Abyssinia have discovered that they make magnificent trapeze wires, and they swing on them and play with them till they come down. The elephants, too, destroy a lot. They have found the iron posts very nice to lean against and to scratch their sides on, and as they were put in to support wires and not elephants, a few give way every day in the elephant regions.

"Inanimate nature also is at work continually to bother the telephone superintendents of Abyssinia. The jungle grows so fast that hardly a day passes in which it isn't necessary to send out a party to cut away some of it where it has reached to the wires. The worst trouble is from the huge creepers that grow over all the trees. They fall here and there all the time, especially after heavy rains. And when they drop over a telephone wire they either break it or else they conduct the current into the earth."

PORTSMOUTH CORPORATION TELEPHONES.

In spite of failures in other quarters, it is evidently quite possible to make a municipal telephone pay, and Portsmouth, England, for one, has apparently succeeded in doing it, says the *Pall Mall Gazette*. The accounts for the year to March 31 last have been sent to us, and provide an interesting study. The capital expenditure, including £2,975 "retention money," has amounted to £31,895, and there were 1,659 instruments working at the end of the financial year, so that the capital outlay per telephone comes to £19 4s. 6d. The total revenue was £5,983, which works out at the very low average of £3 12s. 1d. per instrument, while the total working expenses (including interest and sinking fund, £1,464) were £4,767, an average of £2 17s. 5d. The service therefore is extremely cheap, and it must be worked very economically. Nothing has been allowed for depreciation, unless the repayment of £700 capital may be regarded as equivalent, but the balance of £1,260 at the credit of net revenue account is carried forward, representing nearly five per cent on the capital expended. Taken altogether the showing is a very creditable one, and it is not likely to be

used as a "horrible example" by the opponents of municipalization. Perhaps we may be told that, given similar conditions, the National company could do even better, but unfortunately it doesn't.

SPANISH TELEPHONE STATISTICS.

At the end of 1902 the State Bureau of Telegraphs in Spain presented a report covering the telephone statistics for that country, from which the following quotations are thought to be of interest to our readers:

Systems.	No. of of Subscribers.	Percentage paid to the State.	Rates for Service.
Barcelona	3,111	33.75	$36—60
Madrid	2,131	20.00	60
Bilbao	1,166	34.00	24—36
Valence	1,048	31.50	50
Sabadell	435	22.50	25—48
Santander	361	12.00	18—100
Saragosse	337	20.00	20—72
S. Sébastien	320	21.00	36—60
Séville	310	10.00	40—60
Santa Cruz de Ténériffe	278	10.00	24—32
Las Palmas	255	12.00	40—60
Valladolid	238	10.00	40—60
Toléde	232	16.00	18
Grenada	230	10.00	30—100
Malaga	229	21.00	30—60
Alicante	211	10.00	18—48
Carthagena	207	20.50	30—60

Telephone tariffs are planned upon the usual European method of an installation charge, which depends partly upon the length of the subscriber's line, and in addition a certain message rate for the amount of traffic which is originated by the station. In all cases the telephone companies are required to pay a tax to the state, which varies from ten per cent to thirty-four per cent. In a general way the tariffs vary from $5 to $50 per station for private lines. In cases where there is more than one person the tariffs may rise to from $125 to $200. The installation charge varies by units of about 300 feet in length of line, every additional 300 feet being charged at the rate of from $2 to $4 per annum. The above table shows the most improved of the Spanish systems, together with the state tax and the annual rate.

In addition to the systems mentioned in the preceding table there were seven official telephone exchanges, comprising seventeen sub-stations.

THE TELEPHONE IN MEXICO.

A telephone line has been built between Acarachero place and Nocupetaro, Mexico.

Governor Luis Terrazas of the State of Chihuahua has granted a concession for the construction and operation of a telephone line from Las Cuevas to Roncesvalles and from Morris to Socorro and other points in the state.

The state government of Sinaloa has prepared plans for the construction of an extensive system of telephone lines in that state. The plans contemplate giving Sinaloa more miles of telephone than any other state in Mexico.

Mexican advices state that the syndicate which is being formed to construct a system of electric railways in the city and district of Parral, State of Chihuahua, proposes also to build and operate an extensive long-distance telephone system in the same state connecting all the principal mining camps and agricultural and cattle regions with the capital of the state. Lorenzo J. Arellano of Chihuahua is primarily interested in the scheme.

The Mexican government and the city council of the City of Mexico have extended for a further period of six months the concession held by Jose Sitzenstaller for the construction of a telephone system in the City of Mexico. Under the terms of the extension the work of construction must be commenced within six months from May 4 of the present year. It is stated that Mr. Sitzenstaller is making an effort to organize a strong company to finance and carry out the proposed enterprise. It is his intention to install a complete system which will be a strong competitor of the system of the Mexican Telephone Company now in operation in the City of Mexico.

TELEPHONE AGITATION IN PARIS.

The Paris correspondent of the *Pall Mall Gazette,* London, writes as follows regarding the telephone controversy in the French capital:

The Post Office has fallen among the Philistines, and is having a bad time of it. The *Matin* has been sending one of its representatives round to the various *bureaux*, with the object of spying out the nakedness of the land, and the result of these inquiries makes excellent reading every day. The most part of these offices are likened to stables in which the most active personage is the microbe. Perhaps the bad air has something to do with the indifferent tempers of the *personnel,* which, I regret to say, is the not uncommon feature. On his journey of inspection, the *Matin* representative collected various trophies. One is a blotting pad, for the use of the public, in an advanced stage of decomposition. It is now proudly exhibited in the window of the newspaper building. But the shortcomings of the Post Office are especially to be remarked in the telephone service. All Paris has been ringing with the case of Mlle. Slyviac, who, from ten minutes' conversation with a telephone girl, has won more *reclame* than ten years on the stage. A journalist has also fallen foul of the department, and has been fined by a police magistrate for, it is alleged, using strong language to the *demoiselle de telephone.* The journalist, who was emphatic in his disclaimer, declined to pay the fine, and a *huissier* arrived to seize his furniture. The affair has caused so much commotion, that the government is to be interpellated upon it at the re-opening of Parliament.

But the agitation does not stop here. The Association des Abonnés du Telephone has been born out of the tumult. Its president is M. Maurice de Montebello, nephew of the late French Ambassador to St. Petersburg. It has held its inaugural meeting, which is looked upon as the starting point of an active campaign against a system of which everybody (except presumably the under secretary of state at the head of the department) acknowledges the deficiencies. Seeing that London has its own grievances against the telephone, I thought that some exposition of the ideas of this new society would be useful. Accordingly, I sought an interview with the president, who is an engaging young man with clear ideas as to the duties of a public service. "I contend," he said, "that while the telephone system is so obviously defective, the Department has no right to make the profit it does—twenty million francs a year—out of the subscribers. I believe I am right in saying that in all other leading countries the telephones are conducted at a loss. Either they should improve the apparatus or reduce the subscription, which is £16 a year. The defects of the present system result in great yearly loss to the postoffice. That is especially so in the environs of Paris. If you enter an office in the afternoon you often have to wait half an hour to three-quarters before you can get communication with your number in the metropolis. I have made inquiries and find that the larger proportion of persons go away rather than wait that time. They either take a cab, which is, of course, a needless expense, or they send a messenger. This is of great inconvenience to business people."

We then fell to discussing remedies, and M. de Montebello said he had the idea of proposing an experiment to the director of the department. "In my street," he observed, "there are fifty subscribers. Now, I suggest that we should form a local exchange in the street itself, and put a clerk in charge. The wires would be connected with the state system. I am certain such an arrangement would effect a great saving of time." The association will also take into consideration the advisability of instituting automatic exchanges, which would abolish that interesting young person, the telephone girl. The association, I gather, believes that its grievances reside in the government monopoly, and that a private company would provide a little healthy competition. In this connection M. de Montebello was anxious to know the experience of London with the National Telephone Company.

The new society is a gallant attempt to right a public wrong, but whether it will succeed is a very large question. In the present state of the public finances there is little money to spend on much-needed improvements, more especially as the government is master of the situation by virtue of its exclusive powers. Still, the fact remains that it is losing revenue by its adherence to the outworn system, and many people are taking their names off the list of subscribers pending some improvement.

TELEPHONY IN JAPAN.

That Japan is fully as progressive in the advancement of telephony as it is in the other arts of civilization is evi-

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denced by the report recently sent out by E. C. Bellows, United States consul general at Yokohama, a copy of which was received by TELEPHONY, and is as follows:

Telephones were introduced into Japan in 1877, but those then in use were principally short distance telephones, and they did not form an important factor in business, even in the large cities. At that time the telephone business was left to private enterprise, but later it was undertaken by the government in connection with the telegraph, and it has since been under the control of the department of communications. The government assumed the business during the fiscal year of 1890-91, and June 30, 1891, there were two telephone exchange offices and sixteen telephone call offices open to the public; the length of the lines was 122 miles; length of wires, 808 miles; number of subscribers, 343, and the number of messages which had been sent was approximately 264,988. For some years the increase was slow, but gradually the service became better appreciated, and June 30, 1902, the number of exchange offices was twenty-five, and the number of call offices 179, making 204 public offices, which during the next year increased to 318. At the latter date the length of the lines was 2,340 miles, the length of wires 105,770 miles, and the number of messages sent during the year was about 111,597,714. The number of subscribers at the end of 1902 was 24,887. In Tokio the ratio of the subscribers to the population is as one to 139, but in some cities it is much greater, being as one to forty-eight in Otaru. The telephone has now become so popular that the government is not able to install the instruments and connect the wires rapidly enough to keep pace with the demand, and in consequence the number of unconnected subscribers at the end of 1895 was 4,000, and six years later this had increased to more than 22,000.

In 1902 the value of telephones imported was $97,022.82, of which more than half came from the United States; France, Belgium and Germany ranking next in the order named. There has also been a constantly increasing excess of receipts over disbursements, and the profits received by the government from telephones in 1901 amounted to $315,945.

When the government first took charge of the work naked overhead wires of copper were used, but several changes have since been made to suit varying conditions. Underground cables are used on trunk lines in Tokio, Kyoto, Osaka, Yokohama, Kobe and Nagoya. Both iron and earthenware conduits have been tried, McRoy conduits having been imported from America to some extent. There are also some lead-covered underground cables, containing from 200 to 400 centers. Where the overhead wires still exist, they may be naked, as in most suburban lines; coated with zinc, as in districts where heavy snowstorms occur; or protected by rubber in places traversed by many electric wires. In some instances the same wires are utilized for both telegraph and telephone service.

The circuits are on the duplex telephone system. Several types of instruments have been imported, and at present subscribers are furnished either the solid-back or the Derville. The solid-back is usually provided for public offices and automatic call offices. Leclanche and Fuller batteries have been adopted, and the No. 12 arrester made by the Western Electric Company has superseded the Hibberd Fuze apparatus.

EUROPEAN TELEGRAPHS AND TELEPHONES.

As compared with the traffic of 1892-93, the internal telegrams of Denmark show a decrease in 1902-03, which is attributed to the increasing use of the telephone, conversations by the latter having increased over five times in as many years. The revenue from telegraphs in Sweden has likewise not been very materially enlarged from 1899 to 1902, the date of latest statistics from Berne. No doubt, here again, the extension of telephonic systems has militated against the growth of telegraphic traffic, for there were close upon 52,000 telephones in use in the government service in 1900 and 61,400 in 1902, while companies' lines increased from 50,000 kilometers in 1901 to 58,000 kilometers in 1902. Conversations were about 149,500,000 in the one year and 162,500,000 in the other, an increase of nearly ten per cent. Receipts were 5,750,000 francs, and nearly 6,750,000, respectively, and per instrument, close upon 100 francs. Similarly, in Norway, telegrams are not largely growing in numbers. There were 1,324,869 in 1901, and 1,340,604 in 1902, excluding the foreign traffic, but communications by telephone increased from 1,723,347 in 1901 to 1,920,155 in 1902, the instruments employed being 14,232 and 15,051 in the respective years.

In Germany also the results of 1902 show a diminution of 6,304 telegrams on a total of internal and foreign messages combined of over 42,000,000. But the telephonic conversations increased by nearly 65,000,000, the total being 757,000,000, for which 352,181 instruments were employed, an increase of 46,359. There was a decrease of 42,710 francs for telegrams, and an augmentation of 7,639,008 francs for telephonic rents. The pneumatic tube service in Berlin, Charlottenburg, Friedenen, Westend and other parts has a length of 159 kilometers in all, which, with sixty-eight offices, disposed of 6,000,000 telegrams and nearly 2,000,000 letters or cards.

In Austria telegrams increased by 4.2 per cent in 1902, but no comparison is afforded of the rate of growth of telephone lines; the total conversations and messages exchanged in 1902 being 115,000,000, for which 39,562 instruments were used. In Hungary telegrams numbered 7,750,000 in 1901, and over 8,000,000 in 1902, and, concurrently, telephonic communications increased from 42,750,000 to 49,500,000, passing through 20,090 instruments.

These numbers do not, of course, embrace private instruments and communications exchanged thereby. It is of interest to note that there are 80,000 telephones connected with exchanges in London, and 200,000 in Greater New York, and the increase yearly is probably as great as on the continent.

TELEPHONE NOTES FROM ABROAD.

The Canadian government has just completed a telephone line to Ganges' Harbor, Salt Spring Island, British Columbia.

The new Glasgow telephone service has underground wires 16,500 miles in length. It provides for 20,000 subscribers.

The corporation of Manchester, England, will install a municipal telephone system in co-operation with a dozen neighboring towns.

The town council of Queenstown, Cape Colony, contemplates putting up a plant for telephone and waterworks service; the estimated cost is nearly $350,000.

A telephone franchise has been applied for in Manila, P. I., by the Sociedad de los Telefonos de Manila. The company will be under American management.

It is reported that a deadlock has arisen between the Swansea Corporation and the National Telephone Company of England in regard to the inter-communication between the municipal service and that owned by the company.

The Japanese secretary of the Chinese telegraph service, at the Shanghai office, has been instructed by Yuan-shi-kai to visit Pekin and the northern districts generally, to report on the expediency and cost of forming an imperial telephone service.

Representatives of the Panama Canal commission and the Panama Railway Company have entered into an arrangement for the unification of the telephone and telegraph systems respectively controlled by the commission and the railroad company.

A unique charity is that of a wealthy English woman who has connected every ward of the Middlesex hospital, London, by telephone with one of the best city churches. By the aid of the electrophone the patients are able to hear the entire church services.

French is more easily understood over the telephone than English. In telephoning between Paris and London during a storm, conversation in English is impossible, but French is easily understood because it has so many sibilant sounds and unequally accented syllables.

The Bell Telephone Company will not accept the offer of the Ottawa, Ontario, city council of five years' exclusive franchise, provided the company puts in house telephones at $23, instead of $25, and charges only $5 additional for a desk extension where a wall telephone is installed.

New telephone lines are to be constructed from Madrid, Spain, to the French border; from Madrid to Galicia via Santander; from Madrid to Malaga and Cadiz; from Vich

to Manlleu; from San Vincent de Torello to Ripoll, and from Elche and Noveldo to Pinoso and Crevillente.

The British government will take over the system of the National Telephone Company of that country in 1911. The experiment of government ownership of this most important franchise will be watched with great interest by other countries, particularly the United States, which has so much to contend with in the present Bell monopoly.

Two telephone companies have made application to the board of civic control of Toronto, Ontario, for permission to install a telephone system in the city to compete with the Bell telephone. The Bell has offered to enter into a five-year agreement, and to give some concessions. The board decided to call for offers for a competitive system.

The telephone was used a few days ago for the first time in the history of the Roman Catholic church by its supreme pontiff at the Vatican, when Pope Pius X telephoned to Venice, 350 miles away, and talked with Monsignor Cavallari, whom he had just appointed patriarch of that see, the office formerly occupied by the Holy Father himself.

The special telephone committee appointed by the City of Brantford, Canada, to investigate the question of a municipal telephone system, at a recent meeting, arranged to appoint an expert to look extensively into the matter. It is the purpose of the city to draw up a plan and submit it to the different telephone manufacturers, who will give estimates for a municipal system. No difficulty is anticipated in inaugurating such a system.

The telephone system is of more general use in Sweden than anywhere else in the world. Everybody practically is "on the line," from banker to washerwoman. The service is thus available because of its cheapness. Competition between the General and National companies—the latter a government concern—makes it possible to get a house telephone for $10 a year and several business instruments for $27.50. For a conversation at a booth telephone one pays three cents.

Liverpool was for the first time placed in direct telephonic communication with Paris recently. The communication will be via the London Telephonic Exchange. The arrangements are such that, while Liverpool can speak to Paris, Calais, etc., Manchester, Leeds and other English provincial towns respectively will be able to hold converse with Paris and French towns other than those on the Liverpool list. This plan has been devised in order to connect towns in England and France which have trade interests in common.

The Johnson's Reef and New Moon mines, Bendiga, Victoria, have been equipped by the India Rubber, Gutta Percha and Telegraph Works Company with telephones on the surface and at levels varying from 475 to 2,460 feet down the mine. Apart from the value of the telephone in case of accidents and for giving warnings to prevent accidents, it is said the instruments will soon pay for themselves in the saving of time hitherto occupied in sending requests for tools, materials, etc., from one level to another or to the surface.

The Chinese have been greatly opposed to railroads and telegraph lines because of certain superstitions which are generally believed among the people. But the telephone, on the contrary, has become very popular among all classes of people. The fact that a Chinaman can hear the voice of one of his friends makes him believe that some good angels are carrying the sound along the wire. The telephone reproduces a voice that he recognizes, and therefore the Chinaman does not feel that it is such a mystery as the railroad or the telegraph.

A section of country ten miles north of Guelph, Ontario, is largely provided with rural telephones. Especially are they used in connecting the farm dwelling with the barn and remote sections of the farm. The telephones cost but $2.50 each, and the wire and other connections in the same proportion. It is possible for a farmer with an outlay of $10 to have three telephones on his place connecting his various buildings. The cost of maintenance is said to be but $1 a year for the entire system. In many instances farmers are having the individual telephones installed, and later connected in the form of a neighborhood system.

In the construction of a 750-mile telegraph and telephone line in the Belgian Congo district great difficulties were encountered in crossing several large streams. At Underhill the river was crossed by means of two steel pylons, fifty feet high and 2,620 feet apart, placed respectively 237 and 206 feet above high water level. The crossing of the Kasai River was probably the most difficult, as it was necessary to keep the stream clear for steamer traffic. Advantage was taken of a rocky island in the river, and the crossing was made in two spans, one of 1,472 feet and the other of 2,198 feet, using three supporting pylons. Getting the four conductors into place gave trouble, but it was eventually accomplished by the aid of a steam tug.

It has been discovered that a modification of the telephone can be made use of for the purpose of improving the hearing of persons afflicted with deafness. While this scheme is not always beneficial, it has been found to afford great relief to a large number of persons. Of recent years inventors have devoted themselves to the construction of instruments of this character in the most convenient form and of such shape that they can be used without attracting unnecessary attention. There has been recently patented in this country, the work of an Australian inventor, an installation of this character which can be stowed away in an ordinary derby hat, the only portion of the apparatus exposed to view being two ear tubes which depend from the sides of the hat and repose in the ears. The sound collecting bells are adroitly concealed in the sides of the hat crown.

At a recent meeting of the board of civic control of Toronto, Ontario, the telephone question was discussed at length. Among those present was H. H. Dewart, representing the Canadian Telephone & Telegraph Company, which company is affiliated with the large Independent companies of the United States which are seeking access to Toronto. The principal points arrived at were as follows: The successful tenderer must pay a cash deposit of $100,000, but $10,000 will be refunded upon the completion of each $100,000 worth of work, and where there is $1,000,000 invested the deposit will be reduced to $25,000. This sum will be retained as a permanent guarantee from the operating company. It was also decided that the tenderers must agree to pay five per cent of their gross earnings to the city, including receipts from long-distance services, to all of which numerous penalties were attached in case of failure in any point.

COST OF TELEPHONE SERVICE.

When viewed from a financial standpoint telephone service should be regarded as any other commodity. If a person has business to transact over a telephone, it is certainly worth a fee which should be reasonable and within the reach of all, and one which every one should be willing to pay. While measured service restricts the service to some extent, the conversation which is cut out by such service is usually of the kind which can be profitably dispensed with, although it may cause dissatisfaction, at first, to people who are not accustomed to this way of doing business. A piece of gossip, carried over the telephone, should at all times be worth the price of a business conversation (it is often more expensive, otherwise) and if the Independent companies would insist upon payment of service in proportion to the number of their calls, they would soon have every intelligent person loyal to their support.

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Telephone Tales Tersely Told

Nearly 600 new telephone companies were organized in Iowa last year.

The Citizens' Telephone Company of Battle Creek will install an entirely new system.

The Newark (N. J.) Independent Telephone Company now has over 2,800 subscribers.

Minot, N. D., has more telephones in proportion to its population than any city in the state.

The San Antonio (Texas) Telephone Company is preparing to improve its local system at a cost of $100,000.

The Independent telephone system at Greenville, Illinois, has been reconstructed and greatly improved, at a cost of $20,000.

An automatic exchange has been installed in the Michigan College of Mines at Marquette for the purpose of demonstration.

The Northwestern Railroad has placed in successful operation a phantom telephone circuit on its quadruplex telegraph lines.

The Pure Oil Company has been granted a franchise to build telegraph and telephone lines through the streets of Marietta, Ohio.

To talk from New York to Brooklyn, or vice versa, over a public telephone now costs fifteen cents, instead of twenty cents, as formerly.

An offer has been made of 142½ for stock and bonds of the Home Telephone Company at Fort Wayne, Indiana, the bonds being 6's.

The street telephones, operated in connection with the Wisconsin Telephone Company's system in Milwaukee, have proven a success.

The city council of La Crosse, Wisconsin, has passed an ordinance compelling all telephone and telegraph wires to be placed underground.

The Illinois Telephone Company of Jacksonville, Ill., has increased its capital to $500,000 to carry out its plans for expansion and improvements.

Subscriptions to the stock of the Home Telephone Company of Indianapolis were in advance of the total stock issue by several thousand dollars.

The People's Telephone Company of Penn Yan, N. Y., owned by H. J. Brush, has been sold to the Overland Telephone Company of Prattsburg.

The Lake Shore Telephone Company of Hart, Michigan, is in a prosperous condition. Its new directory shows over 743 telephones in Oceana and Muskegon counties. A large percentage of these are residence telephones. The demand for telephones throughout Oceana county is so great that the company has had difficulty to obtain instruments to fill the orders.

The Trivoli (Ill.) Central Telephone Company will construct a new exchange, to which several farmers' lines entering the town will be connected.

During the past six months 3,500 rural telephones have been installed in Kansas, and it is estimated that 2,000 more will be installed during this year.

The Interstate Telephone Company of Washington contemplates building a line from Spokane, Wash., to Harrison, Idaho, a distance of 200 miles.

Rural telephones will soon connect all parts of Sonoma county, California. Six different systems have been installed during the past two months.

The Ontario Telephone Company of Oswego, New York, will, it is stated, place its wires underground, at an expense of several hundred thousand dollars.

The Benzie County (Mich.) Telephone Company has decided to put in a "girlless exchange," and is making arrangements for the installation of the same.

The Lima (Ohio) Telephone Company is making arrangements to improve and enlarge its plant. When completed it will have a capacity of 1,000 subscribers.

The Merchants' Mutual Telephone Company of Michigan City, Ind., will overhaul and reconstruct its local system during the summer at an estimated expenditure of $15,000.

The Harvard (Ill.) Telephone Company at its annual meeting recently declared a ten per cent dividend. Reports showed the company to be in a very satisfactory condition.

The Mt. Vernon (Ohio) Telephone Company installed over 400 telephones last year. It has reorganized with $150,000 capital and will greatly enlarge and improve its system.

A new telephone system has been installed at Fortville, Indiana, with the latest equipment. About eighty subscribers have been secured in town and 300 in the rural districts.

The United States Long Distance Telephone Company of Los Angeles, Cal., has been incorporated with a capital stock of $3,000,000. A. F. Morlan and L. J. Maguire are interested.

The growing business of the Ottawa (Ill.) Home Telephone Company has made it necessary for the company to seek larger quarters in order that it may increase its switchboard capacity.

In order to accommodate increasing patronage, the Utica (N. Y.) Home Telephone Company will make an extension to its main switchboard which will accommodate 500 additional connections. Since April 1 of last year the number

of telephones in operation has increased from 1,300 to 2,800.

The farmers in the vicinity of Germantown, Kan., will organize an Independent Telephone Company to give service between Horton, Germantown, Powhattan and the Kickapoo Mission.

The Automatic Home Telephone Company, capital $25,000, has been incorporated at Jonesboro, Ark., by Marcus Berger, H. E. Schnee, A. C. Gambill, R. L. Collins and C. A. Daniels.

The Hutchinson (Minn.) Telephone Company has increased its capital stock from $25,000 to $50,000. About seventy-five miles of farmers' lines are to be built, taking in over 200 farmers.

Permits have been granted the Fitzsimmons Telephone Company to string wires in a certain portion of Cleveland, which may be used by the company for a connection with lines outside the city.

The Inter-Ocean Telephone and Telegraph Company of Buffalo, New York, reports a great increase in its long distance business. This company connects with 500 towns and has over 50,000 subscribers.

The Standard Telephone and Telegraph Company, a corporation whose lines extend into many parts of Bucks county, Pennsylvania, has been absorbed by the Keystone Telephone Company of Philadelphia.

The Home Telephone Company of Rockford, Illinois, will build a line direct to Freeport this summer, making connections with Pecatonica, Winnebago, Ridott and other points between Rockford and Freeport.

The New Home Telephone Company of Bloomfield, Indiana, has authorized the issuance of preferred stock to the amount of $100,000 for the purpose of securing funds to extend the lines and improve the plant.

The telephone managers in Audrian county, Missouri, are making an effort to form an Independent union of all the smaller companies in that section. A telephone franchise will be applied for in Mexico, Missouri.

The Buffalo & Susquehanna Railway Company is equipping its freight trains with telephones. Connection is made with the wires along the railroad by means of a sectional pole that has a hook to fasten on the wire.

All the mines in the vicinity of Juneau, Alaska, within a radius of forty miles, will be connected by telephone during the summer. President Webster of the Juneau Light and Power Company is interested in the project.

The Syracuse, New York, Telephone Company, of which J. J. Jermyn is president, has in mind an automatic system for that city, and with this end in view systems of that character are being inspected in other cities.

Mrs. F. G. Harrison, wife of the manager of the East Tennessee Telephone Company's exchange at Bowling Green, Kentucky, is said to be one of the heirs to the Dismukes estate in Baltimore valued at $8,000,000.

At a meeting of stockholders of the Illinois Telephone Company, held in Jacksonville, the capital stock of the company was increased from $100,000 to $500,000. It is intended to close the gap between Jerseyville and Alton this summer, connecting at Alton with the Kinloch for St. Louis.

The Alamo Telephone Company of Almagordo, New Mexico, is seeking information regarding wireless telephone apparatus, to use in talking from one mountain to another—a distance of from twenty to thirty miles.

The Evart (Mich.) Telephone Company has disposed of its exchange and seventy-eight miles of toll line to the Citizens' Telephone Company of Grand Rapids. These lines reach Marion and many other Osceola county villages.

The Home Telephone Company of Deadwood, S. D., is to have a new system in Deadwood and the Black Hills and expects to give a service that will be the best that can be secured. Clyde Dunseth has been appointed manager of the company.

The Loyalsock (Pa.) Telephone Company contemplates extending its lines. The company has been in operation for four months and it is estimated that the line has earned at the rate of fifteen per cent net to the stockholders during that time.

The Board of Supervisors at Greenville, Illinois, has granted two separate franchises to construct county telephone lines, one to Ed De Moulin, Joseph Story and John L. Bunch, the other to Eli Armstrong and A. L. Bone, all Greenville men.

The Citizens' Telephone Company of Racine, Wisconsin, has purchased a site for $4,000 and it is the intention to erect a telephone exchange. The company has 2,000 subscribers, and plans are being made to extend the toll system to Minneapolis.

The directors of the Grayson County (Texas) Telephone Company recently met at Sherman, Texas, and it was decided to purchase $50,000 worth of material, which will be used in extensions and improvements in the cities of Sherman and Denison.

The Greenfield (Ind.) Telephone Company recently suffered a severe loss by fire. Two cables, containing 100 wires each, were melted by the intense heat. A valuable fuse board was also destroyed. The company will now install modern apparatus.

A bill has been passed in the legislature of Tennessee, authorizing telephone and telegraph companies to exercise the right of eminent domain. As it affects to an extent the interests of all electrical companies in the state, it is attracting considerable attention.

During a storm at Wales, Massachusetts, lightning struck the residence of Judge H. A. McFarland, tore out his telephone and threw a part of it across the room. The family was sitting within four feet of the telephone at the time, but no one felt the shock.

Perkins County, Nebraska, is now able to talk with all towns within forty miles by means of the telephone. This makes a great difference to the ranchmen, who live so far from town and were formerly compelled to make long drives, where they can now telephone.

The Western Independent Telephone Company, which comprises nearly all the Independent companies in Kansas, Oklahoma and Missouri, has given a mortgage to the amount of $1,500,000 to the Commonwealth Trust Company of St. Louis. The mortgage covers all the toll lines

in this territory and the money will all be used to repair the lines and build new ones.

The Kinloch Telephone Company has installed in the Palace of Electricity at the St. Louis exposition a "model" telephone exchange. The switchboard is for 1,000 lines, and instruments have been placed in all of the World's Fair buildings and in all parts of the grounds.

The Illinois Telephone Company has just placed in operation at Whitehall, Illinois, a new metallic magneto system, which is said to be one of the finest of its size in that part of the state. The new exchange starts out with 300 subscribers. J. Otis Jones is local manager.

The rapid extension of rural telephone service in South Dakota is indicated by the action of the Yankton county commissioners at their late session in granting permits to four different companies to use the highways in that county on which to string wires for telephone service.

The New Jersey and Pennsylvania Telephone Company, with exchanges at Belvidere and Phillipsburg, New Jersey, and Easton and Bethlehem, Pennsylvania, and which operates several other branches, has been sold to J. Davis Brodhead, the attorney for the bondholders, for $25,000.

The Rogers Telephone Company has been organized at West Union, Iowa. The men at the head of it are: Oscar Wentworth Rogers of New York city, O. A. Rogers, H. P. Hancock, T. S. Green, C. H. Telmadge and F. Y. Whitmore of West Union. It will be capitalized for $25,000.

The Hutchinson Wireless Telephone Concession Company has been organized at St. Louis. The incorporators are: M. R. Hutchins, Hallon C. Spaulding, Boston; Edward C. Husted, L. Z. Harrison, St. Louis. The object of the company is to operate a system of wireless telephones.

J. M. Oliver of Orlando, Florida, is building a telephone line from Jacksonville to Tampa, and expects to include Bartow, by building a line from there to Bartow Junction. The enterprise is known as the Florida Co-operative Telegraph & Telephone Company, and is capitalized at $100,000.

The Northern Illinois Telephone Company of Sandwich, Illinois, has had a very successful year. A three and one-half per cent semi-annual dividend was recently declared. At present the company has 2,286 telephones in operation, returning an approximate revenue of $10,000 each quarter.

The Automatic Monitor Company of Toledo, Ohio, has been incorporated to manufacture a device that will show the length of time the telephone receiver has been off the hook. The device is an invention of D. A. Yoder. H. R. Ashbrook and others are also interested in the new company.

The White Bear (Minn.) Telephone Company announces a 10-cent extra charge on local and long distance calls between 11 p. m. and 7 a. m., the sum to go to the operator, in addition to her salary, as a means of both inducing fewer calls at night and of getting the operator to be more attentive.

The Home Telephone Company of San Bernardino, California, has more than 40 subscribers at the present time and applications for other instruments are coming in thick and fast. The San Bernardino exchange is reputed to be one of the most successful in the state and its service is declared by experts to be superb. Manager Lisenby hopes to increase the number of subscribers at least fifty per cent within the next year.

Two companies which will operate telephone systems in Eastern Montana and Billings, Mont., were organized recently in the latter city. They are the Billings Mutual Telephone Company, with a capital stock of $40,000, and the Montana Telephone Company, with a capitalization of $10,000.

The directors of the Home Telephone Company at Cortland, New York, have decided to install a new multiple switchboard at the central office, this step being made necessary by the great increase of business since the organization of the company. The company now has about 1,100 subscribers.

The council of Bismarck, N. D., recently voted to discharge the city attorney, because he is interested in the Bismarck Telephone Company, a corporation holding a franchise from the city. The mayor ruled that the law did not apply to a simple stockholder, but the council proceeded to vote as stated.

At a recent meeting of the Lewis County (Mo.) Telephone Company at Canton, Mo., the number of directors was increased from six to nine. The company owns 600 miles of line and has over 1,200 subscribers in Lewis and Clark counties. It also owns a number of exchanges at different points.

A suit has been started in Media, Pa., by the United Telephone and Telegraph Company to recover $30,000 from the Bell company for the alleged destruction of wires during the sleet storm of February 21, 1901. The United company alleges that the Bell people cut the former's wires, entailing great loss.

The Mutual Telephone Company of Des Moines, Iowa, owing to inability to secure a suitable exchange building by leasing, has decided to erect a new building to be used exclusively for exchange purposes. The new structure will be fireproof and when completed will be one of the finest of its kind in the west.

The Nez Perce Co-operative Telephone Company is promoting an organization of the Independent lines in eastern Washington and northern Idaho and the establishing of a switching rate that will enable the lines to be operated in conjunction to the advantage of the companies concerned and to the public.

A combination of Independent telephone companies is reported as being formed for the purpose of fighting competition throughout the west. The report comes from Seattle, Wash., where the Independent Telephone Company is preparing an extensive war without waiting for the combination to be perfected.

Telephone service aboard the Detroit and Cleveland boats is an innovation of this year's navigation. Telephones have been installed on all the boats and each morning when they come in from their trips connections are made with the local exchanges. Both local and long distance service can be had in Cleveland and Detroit.

The new long-distance switchboard that has been arranged by the Cleveland Telephone Company occupies about two-thirds of the fifth floor of the building, and in all sixty operators will be employed. The board, when completed, will cost about $40,000, but the management

feels fully justified in making the expenditure, in view of the amount of business that is transacted over the wires daily.

A mean piece of business was perpetrated near Helena, Minnesota. Some vandal slashed the wires of the Minnesota Valley Telephone Company, the Western Union Telegraph Company, and the Northwestern Telephone Exchange Company. The business of the lines was interrupted until repairs could be made.

An ordinance has been introduced at Hastings, Nebraska, granting a sixty year franchise to the Hastings Independent Telephone Company. Under the ordinance, if passed, the company agrees to lay all wires under ground, furnish the city four telephones free and have the system installed six months after the franchise is granted.

The earnings of the Albany (N. Y.) Home Telephone Company for the first fifteen months of operation has been nine per cent on the stock, after providing for all expenditures for operation and maintenance and for interest on the six per cent bonds. Nearly 1,200 new telephones were placed by the company during the year.

D. A. Walker of Columbus, Ohio, owning the controlling interest in the Independent exchange at San Antonio, Texas, has acquired a controlling interest in the Tyler (Texas) Telephone Company, and also the Globe Telephone Company of Tyler, which owns and operates 112 miles of toll lines. The exchanges will be enlarged.

The Independent Telephone Companies of Owensboro, Henderson and Paducah, Kentucky, have completed arrangements for putting in additional toll lines between Henderson and Clarksville, to extend over a 100-mile territory. The lines will pass through Paducah, Marion and other places and will be extended to Owensboro.

The Topeka (Kan.) Independent Telephone Company will have a home of its own, having just purchased a building for $8,000. As soon as possession is secured, the building will be remodeled and refitted into a first-class telephone exchange capable of handling the large business of this company, which now has about 2,500 subscribers.

The merging of a half dozen presumably Independent telephone companies in the Southwest brought to light the organization of a company which has practically covered all east Texas and western Louisiana, and will fight the Southwestern Telephone Company in the Southwest. H. E. Huntington is at the head of the syndicate.

A recent report issued by the National Telephone Company of Fort Wayne, Indiana, shows the business to be in a very prosperous condition. The entire plant has been reconstructed and the central energy system installed throughout. The company has over 3,000 subscribers and a large number of new contracts are being signed every week.

A merger has been formed by the union of the Plattsmouth (Neb.) Telephone Company with other companies, which is to be known as the Interstate Independent Telephone Company. By this merger the Plattsmouth company, which has been unsuccessful in its attempts to secure a foothold in south Omaha, will now be able to gain entrance.

During the coming summer Thunder Mountain, Idaho, will be connected with the outside world by an up-to-date telephone service, the installation of which has already commenced. Emmett, 160 miles distant, will be the other terminus. On account of the rugged and mountainous nature of the country, the cost of the line is estimated at $100,000.

The Home Telephone Company of Rockford, Illinois, has issued a new directory, which shows within the city limits a list of over 1,800 subscribers. Connections are made with Belvidere, Caledonia, Poplar Grove, Argyle, Hunter, Guildford, Beaverton and Manchester. By the time the next directory is issued it is expected that the list will have increased to over 2,000 subscribers.

The Proffit Telephone Company of Seymour, Texas, capital stock $40,000, has been chartered to construct and maintain telephone lines in the counties of Baylor, Archer, Wichita, Wilbarger, Foard, Cottle, Motley, Floyd, Hale, Lamb, Bailey, Cochran, Hockley, Lubbock, Crosby, Dickens, King, Knox, Young, Throckmorton, Haskell, Stonewall, Kent, Garza, Lynn, Terry and Yoakum.

Startling, and without precedent in the history of corporation taxation in Nebraska, are the figures returned by the Automatic Telephone Company of Lincoln, Nebraska, on a tax schedule filed with the county assessor. The company admits having personal property valued at $200,000 in Lancaster county. The Nebraska Telephone Company valued its property at a little more than $38,000.

A cable dispatch from London states that a syndicate represented by Charles J. Glidden and E. Bertram Newton of Boston, has purchased the rights to use the Armstrong-Orling wireless telegraph and telephone patents in the United States and Republic of Mexico. Mr. Glidden is a veteran telephone manager and financier, prominent formerly in the Erie Telephone and Telegraph Company.

The Southern Telephone Construction Company, which installed the new automatic system at Columbus, Ga., has completed its contract and turned the system over to the company. John T. Norman is president of the home company. The contract with the construction company called for 700 telephones in actual operation. This has been exceeded by 300, and 1,000 instruments are now in operation.

Peter and Clarence Fisher of Waterville, Ohio, were rescued from drowning largely through the medium of a rural telephone. Their boat capsized in the river near that town, and they were carried down toward the rapids clinging to the boat. Word of their danger was telephoned to William Cobb's residence down the river, and when they reached that far a boat and other appliances were in readiness to rescue them.

The organization of an Independent telephone company and the construction of a new exchange in Council Bluffs, Iowa, to connect with other Independent telephone exchanges of southwestern Iowa, and the state in general, is being agitated. The exact personnel of the new company is not fully decided, but it will include several leading Council Bluffs citizens and some who are interested in Independent exchanges elsewhere.

Competition conditions in Topeka, Kansas, have reached a novel stage. The Topeka Independent Telephone Company now has over 2,300 subscribers, which number is steadily increasing. The Bell company is allowing many instruments to remain in service without charge, and those in a position to know say that it is doubtful if it has over 500 paying telephones in the city. Recently the monopoly company forgave a nine months' account for two telephones for the privilege of the quarter just beginning, and in another instance an account of six months for one telephone

was overlooked, the conditions being the same as in the previous case.

Arrangements have been made between the Bell Telephone Company and the Home Telephone Company of Cortland, New York, by which the Bell company transfers all its interests in Cortland county to the Home company and withdraws from all of Cortland county, Dryden and the borders of adjoining counties, and wherever the Home company is now located, or wherever it would be likely to extend itself in the way of farm lines.

Toledo (Ohio) capitalists are branching out in the telephone business in California. The Toledo men who recently installed a telephone plant at Los Angeles have financed another company for San Diego. The officers of the San Diego Home Telephone Company are: President, Charles E. Sumner; vice-president, Frank Graves; secretary-treasurer, William M. Godfrey. Messrs. Detwiler and George Metzgar are also identified with the enterprise.

The Cadiz (Ind.) Telephone Company will, in the future, have no affiliation with the Bell interests. At a meeting of the stockholders a resolution was passed, declaring all business in the future will be done with Independent companies, as it is feared the Bell people have been trying to secure control of the system. It is composed of nearly thirty rural lines, with from ten to forty patrons each, and has connection with all towns of the county by direct lines.

Prior to the establishment of the new telephone plant in Atchison, Kansas, the charge was $50 per year for business telephones and $35 per year for residence telephones, or $85 a year for the two. Now the charge is: Old telephone, residence, per year, $9; business, $18; new telephone, residence, $12; business, $18, or a total of $57 per year for the four, or a saving of $28 per year because of the new company, to say nothing of better service, and a much larger exchange.

The officials of the Cuyahoga Telephone Company at Cleveland, Ohio, report business coming in at a very satisfactory rate. The company now has about twelve first-class solicitors at work and they are being well received all over town. The new contracts are averaging at the rate of fifty a day and the officials believe that before the end of the year they will have fully 16,000 telephones in use in Cleveland, which will put the common stock to a point where it will earn a dividend.

The Local Telephone Company of Martinton, Illinois, has closed a contract with the Central Union Telephone Company whereby all telephone property owned and controlled by the Central in the towns of Martinton, Pittwood, Ashkum, Clifton and Chebanse becomes the property of the Local Telephone Company, the Central retiring from the local field, but retaining the long distance lines. This gives the Local Telephone Company connections with all cities in Ohio, Indiana, Illinois and Iowa.

In moving a house in Noblesville (Ind.) across trolley track it was necessary to raise the trolley wires four feet, which brought them in contact with telephone wires, setting the exchange on fire and burning out over 200 telephones. Nearly every telephone in the city is said to have rung and persons who answered the bell received a shock, and some were burned. Large balls of fire darted across the room of the exchange office, causing the night operators to leave the place hurriedly and run to the fire department to sound the alarm. Upon their return the fire in the terminal room had reached the ceiling and was spreading rapidly. A great deal of delicate machinery was destroyed, the loss reaching several thousand dollars.

The People's Telephone Company of Fort Worth, Texas, which has been in operation about two months, already has close upon 1,000 subscribers. The company was incorporated August 14, 1903, with a capital stock of $250,000. The officers are: President, William Rowland; secretary, C. B. Luck; treasurer, W. H. Jones. The company has exchanges at Gainesville, Denton, Valley View and is now completing its copper trunk long distance toll line between Gainesville and Fort Worth, via Denton.

The Independent telephone in Binghamton, New York, is an unqualified success, and those who have the service would not think of attempting to do without it again. One of the things the new company has done is to reduce the telephone rates to such an extent that it is now possible for a person to have both telephones at about the same price that one cost before the new company came to the field, so that the argument that two telephones would be necessary does not carry much weight, as it would mean hardly any additional expense.

While not a large system, one of the most successful of its size in Iowa is the Inwood Independent Telephone Company's exchange at Inwood, Iowa, owned and managed by Carl Dyvig. It started in 1903 with forty-five local subscribers and five farmers' lines, which added sixty other subscribers to the exchange. The system has been in operation less than a year and now has seventy-five local subscribers and nine farmers' lines, with nearly 200 subscribers. The best of service is given, there are no complaints, and the exchange is proving a paying venture.

The Delaware and Madison Counties (Ind.) Telephone Company is building thirty miles of farm lines in all directions out of Elwood, which will connect 200 farmers. It is also building forty miles out of Anderson, which will enable it to connect up 235 farmers. It expects to build in the neighborhood of twenty-five miles of farm lines out of Muncie this season, and about fifteen miles of pole lines out of Alexandria. The cable capacity in Muncie, Anderson, Alexandria and Elwood is exhausted, which will require it to put in the neighborhood of 150,000 feet of cable.

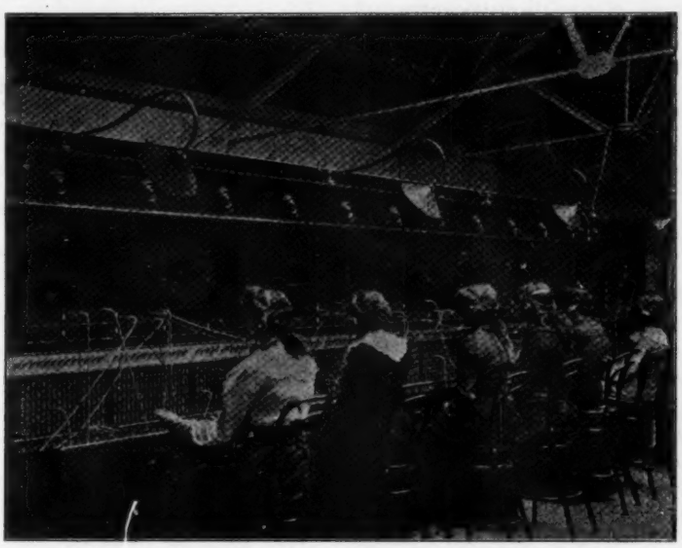
M. H. Spere of Wakefield, Nebraska, manager of the Northeastern Telephone Company, has purchased for his company the Black Hills and Sioux City telephone line and the two lines have been consolidated. Mr. Spere states that the Black Hills line will be rebuilt and a good metallic toll line will be put in. By the purchase of the Black Hills line the Northeastern Telephone Company will have 218 miles of toll line. The company also expects to connect with the new Independent company at Sioux City and then direct communication can be had with South Omaha and Lincoln.

The Home Telephone Company of Deadwood, South Dakota, is rapidly getting its lines up in first-class shape, many of them now being completed. General Manager Clyde Dunseth is very much pleased with the number of subscribers added since he took charge, and particularly with the number of old patrons who have returned, showing plainly that they were only waiting until they saw that the company meant business. A large list of new subscribers has recently been added. The line to Spearfish is completed and many subscribers have been added there. The Sturges line is working in first-class shape, and as soon as the Belle Fourche line is completed the Sturges line will be able to get connection.

Municipal Telephony in Brighton, England

A NUMBER of municipal telephone systems are being successfully operated in England at present, and this article will deal with the workings of the exchange at Brighton.

The area served extends north as far as Burgess Hill, east to Falmer on the Lowes road, and westward to Hove. Burgess Hill is the only outlying branch at present open. In the town and to Hove the cables are laid underground, but country services have overhead metallic circuit. The central exchange is close to the Pavilion. On leaving the "pothead" on the underground cable the wires rise to the tabs on the heat-coil and lightning arrester strips, and are then carried across the test frame to the test jacks on the other side, asbestos covering being used for all wires on the frame. Thence they are taken as asbestos covered cables of twenty wires each to the switchroom on the floor above, soldered to the line springs of the multiple jacks and branched off to the corresponding jacks on each section. For calling, the series system is adopted, thus avoiding the use of relays for cutting out the calling indicator. On the ground floor is the testing apparatus, designed by R. Dolman, chief inspector, which is very simple and easy of manipulation. It consists of a four-way switch battery and galvanometer, and can be used to detect an earth on either of the wires of a circuit, or, by a loop test, to find a short or disconnection in the subscriber's instrument. The running generator can also be brought into circuit, so that subscribers' bells can be adjusted under running conditions. The fourth position of the switch is for speaking, and two-way battery switch gives two volts or full voltage at will on the earth test. For the loop test four volts are used. The running generator for ringing is a magneto machine giving seventy-five volts driven by a ¼-h. p. motor. Hard by is a Leclanche battery, which supplies current to work the indicators whereby the subscribers may call the exchange. For this a storage battery will probably be substituted.



EXCHANGE MULTIPLE SWITCHBOARD AT BRIGHTON.

The exchange is on the first floor and has the multiple switchboard. The connections at the back are such as to be very accessible for repairs. When a subscriber lifts his receiver one of the lines is momentarily grounded, thus a circuit is closed from the calling battery through his indicator through the inner springs of the answering and multiple jacks and back by the wire and earth to the battery. The inserting of the answering plug parts the springs and cuts off the battery and indicator, and a spring is pressed against a stud in connection with the engaged test battery, which is thus connected to the bush of each multiple jack. In replying to the call the operator inserts the plug in the calling subscriber's jack, at the same time automatically restoring the indicator, pulls over the key to the speaking position, and asks for the number required. Then, having made the engaged test by touching the bush of the called subscriber's jack, if she finds the line disengaged, the operator pushes home the ringing plug, and the subscriber is called by pushing over the lever of the key to the ringing position, thereby switching the current from the magneto generator onto the line. The clearing indicators are so wound that subscribers, when put into communication, can ring through to one another without calling the exchange. Thus if the called subscriber be dilatory in replying the time of the operator is not wasted. Since this involves fitting a magneto to every subscriber's instrument the advantage appears problematical. There are two clearing indicators, corresponding respectively to the answering and calling plugs. When the called subscriber answers the latter drops and is restored mechanically. When either subscriber replaces his receiver the line is momentarily earthed, and that subscriber's clearing indicator drops. The operator does not, however, clear the line until the calling subscriber's indicator drops. When the cords are replaced the clearing indicators are restored automatically.

Should a subscriber desire to call up anyone outside the area the operator passes the call on to the postoffice by means of an outgoing call-wire within the reach of any operator on the board. When the call is answered the postoffice operator calls to the corporation exchange giving the number of the junction wire she requires the subscriber on, thus, say 500 on 6. The operator takes up plug No. 6, makes the engaged test, and presses the plug home. She then pushes the key to the ringing position, and it remains there in this section of the board until the subscriber answers the ring, when it returns automatically to the through position. This is done to prevent the postoffice receiving a false clearing signal through the line being momentarily earthed when the subscriber lifts his receiver. The key is released on the receiver being lifted. When the key is in the ringing position the current is sent out through a double wound electro-magnet, the armature of which is furnished with a clutch which holds the key in that position. So long as the current passes through both wires the magnet is not excited, but when the subscriber in lifting his receiver earths one side of the line, the ringing generator being also earthed, the current ceases to flow in one coil, and the other actuates the magnet and releases the key. The replacement of the telephone on the completion of the conversation by momentarily earthing the line works a relay on the postoffice section, through which the current continues to flow, and gives the clearing signal to the postoffice operator. The withdrawal of the plug in obedience to that signal puts into circuit a battery of equal

voltage, but of opposite polarity, thus neutralizing the current through the relay and allowing its tongues to drop. This puts the postoffice current through the corporation clearing indicator, the junction operator withdraws the plug, which on returning to its socket breaks the circuit, and the normal position is resumed as before the call.

In Brighton municipal telephony is being used as a temporary expedient to extort reasonable terms from a monopolist company. The municipal exchange cannot get at subscribers of its competitor, though it can reach those outside its own area, the postoffice trunk lines acting as mediator. It relies, therefore, for its success on its greater cheapness. The price, £5 10s for unlimited service, has already tempted 790 subscribers, and outside of the above-mentioned inconvenience the service given the public by the municipal company is very satisfactory.

TELEPHONE MEETINGS.

At a recent meeting of the officers of the Carroll County (Ind.) Co-operative Telephone Association, held at Flora, Ind., every company was represented. A committee composed of the president of each company was appointed to confer with the Delphi Commercial Club for the purpose of securing a franchise to enter Delphi.

The Central Illinois Telephone Association recently held an interesting meeting at Springfield, Illinois. Those present represented 12,741 telephones in use, about one-third of the total number of Independent telephones in that territory. There are twenty-five Independent telephones to every Bell telephone in the same territory.

The Central States Telephone Association, with headquarters at Terre Haute, Ind., was recently organized by those interested in Independent telephone lines throughout Indiana, Illinois, Ohio, Kentucky and Missouri. The following officers were elected: President, Frank M. Boyd, Rockville; secretary, A. J. Heitz, Vincennes; treasurer, C. R. Duffin, Terre Haute. The purpose of the association is to compile a rate and route book of the Independent lines throughout Indiana, Ohio, Kentucky, Illinois and Missouri.

At the first regular meeting of the Southeastern Kansas Telephone Association, recently held at Parsons, Kan., more than $6,000,000 was represented. Twenty-one managers and owners of various systems represented by the association were present. Constitution and by-laws were adopted and the following officers elected: President, Geo. H. Spangle, Chetopa; vice-president, E. W. Dow, Baxter Springs; secretary and treasurer, M. L. Robeson, Galena. The toll line proposition was discussed and committees appointed to establish rates and fix commissions.

The directors of the Central States Telephone Association, which was recently organized by those interested in Independent telephone lines throughout Indiana and Illinois, held a meeting at Muncie, Indiana, and elected the following officers: Frank M. Boyd of Rockville, Indiana, president; A. J. Heitz of Vincennes, secretary; C. R. Duffin of Terre Haute, treasurer. The purpose of the association is to compile a rate and route book of the Independent lines throughout Indiana, Ohio, Kentucky, Illinois and Missouri. The headquarters of the association will be located in Terre Haute, and meetings will be held on call of the president.

A meeting of considerable importance to the Independent telephone lines and their connection in northern Missouri was held in St. Joseph recently. Among those present were J. E. Zeluff, superintendent of the Home Telephone Company of Kansas City, and who is recognized as one of the most efficient telephone and electrical men in the business. W. F. Rankin and Frank S. Travis of Tarkio were present from the northern part of the state. A large sum of money was appropriated by Mr. Rankin and his friends to construct a through copper circuit between St. Joseph and Kansas City, and it was for the purpose of perfecting the details of their connection with the Home Company of Kansas City and the Citizens' Company in St. Joseph that the meeting was called.

GIRL SUES COMPANY FOR $10,000.

A suit which, if brought to trial, will be somewhat sensational in character, was filed at Davenport, Iowa, recently in the district court by Miss Laura Evers, formerly employed by the Iowa Telephone Company, against the same company, wherein she alleges she has been deprived of her position as an operator because of alleged insinuations against her character, further alleged to be the result of certain conversations carried on over the telephone lines between Miss Evers and certain young men. The petition alleges that upon attempting to learn the cause of her dismissal she was told by the chief operator that because of objectionable conversations carried on by her over the telephone fifteen of the operators had made complaint and would resign unless she was dismissed from the service. The petition cites certain of the insinuations. Miss Evers asks for damages in the sum of $10,000.

A TELEPHONE ROMANCE.

BY OLE BABBERINO.

Oh, *she* was a pretty "hello girl," with a voice that was soft and sweet;
Her manner was charming—yes, very—her figure was trim and petite;
Her eyes were like those of a young gazelle; her lips were like cherries red,
And a glorious mop of Zaza hair sat like a crown on her head.

And *he*—oh, *he* was a millionaire, with oodles of money to burn;
He had houses and lands and stocks and bonds, but they didn't prevent a yearn
From filling his heart (he had a heart) and setting his head in a whirl
Each time he turned to the telephone and talked with this "hello girl."

The sound of her voice (ye gods! *what* a voice!) sort of soothed his troubled mind,
And he said to himself, "If she's sweet as she talks, then methinks I have made a find."
So he sought her out, and his fondest dreams were realized in this Miss,
And when he proposed she said, "Why, cert!" and gave him a Nethersole kiss.

And now as his wife she wears diamonds and silks, with all of the extra frills;
She rides in a lovely benzine cart, and hubby—*he* foots the bills;
She spends his "rocks" with a lavish hand, but he only smiles the while
And says, "What care I? She's the queen of 'em all, and moreover, she's just my style."

L'Envoi.

If a "hello girl" would a husband win, with gold, and a castle own,
Let her spruce up neat and talk in a coo when she answers him over the 'phone.
For it's better to be a "hello girl" and end as a millionaire's wife
Than an heiress with spitcurls and millions, and have to go single through life.

Chains and telephones are to be used by the police of Egg Harbor and the constable of Mullica township in waging war upon automobilists who laugh speed regulations to scorn in their efforts to establish a new record between Philadelphia and Atlantic City. A telephone line will be erected along the cross-state road for a mile or more, and Elwood will keep tab upon all chauffeurs. When police receive word that an automobile is exceeding the speed limit they will stretch a chain across the road and greet the auto man with a warrant.

Fire Hazard of Telephone Exchanges

WILLIAM T. BENALLACK

On the widely discussed and all-important question of fire hazard of telephone switchboards and exchanges, *The Survey*, a journal devoted to fire insurance, recently requested of William T. Benallack his views upon the subject, which he gave as follows, and which were published in a recent issue of *The Survey*:

In accordance with your recent request for information regarding the "Fire Hazard of Telephone Switchboards and Exchanges," I have made some personal investigation and compiled some statistics regarding number of fires, origin, losses, etc., that have been reported during the past ten years through the quarterly fire reports issued by the Electrical Bureau of the National Board of Fire Underwriters. These figures are not expected to be a complete list of the fires and losses from this source, but at least the information will be of interest, and should be considered fair from a statistical point of view:

NUMBER OF FIRES.

Number of fires listed where damage resulted to exchange	58
Number of fires listed where damage resulted to subscribers	276
Total	334

LOSS.

21 fires in exchange losses, small or not stated.	
6 fires in exchange losses, considerable but not stated.	
31 fires in exchange losses, reported	$314,018.00
202 fires outside exchange losses, small or not stated.	
2 fires outside exchange losses, considerable, not stated.	
72 fires outside exchange losses, reported	331,824.00
Total	$645,842.00

ORIGIN.

Heavy winds breaking down lines and making contact with light and power wires	4
Heavy snow or sleet breaking down lines and making contact with light and power wires	13
Lightning entering on lines	26
Lines coming in contact with trolleys	126
Lines coming in contact with electric light and power lines	165
Total	334

As will be seen by the above, about 17 per cent of the fires resulted in loss to the telephone exchange and the balance of 83 per cent resulted in damage out on the line at junctions, boards and in subscribers' premises. The loss, however, on the exchanges amounts to almost as much as those out on the lines.

I have no information on hand as to fires from sources other than electrical, and the existing hazard, of course, depends on the construction of the building, occupancy other than telephone, and exposures.

Many of the larger and more recently constructed buildings are of excellent construction, used exclusively for telephone purposes, the hazard ordinarily being the switchboard itself, normally safe, but constituting an element of hazard on account of the liability of high voltage current being introduced by the outside lines coming in contact with the various trolley, light and power wires; also the liability of lightning discharge entering over the wires.

There is also a certain amount of hazard from the repair gang having headquarters in the building.

I recently inspected one of the large telephone exchanges, and found everything extremely clean; fire extinguishers, boxes of sand, pails of water and asbestos blankets located at convenient points, to use in case of emergency, and every possible precaution seemed to have been taken to avoid the starting or spreading of a fire. The success of the telephone business depends, to a great extent, on the efficiency and continuity of the service, which fact should and (among the more important exchanges) does insure a greater degree of attention towards maintaining a high class of line construction; the use of proper protectors on both the exchange and subscriber ends of the line; in many cases the putting of the lines underground in certain areas; the bunching of wires in cables; and, in general, a constant regard for the importance of suitable fire protection.

The later type of switchboards run into considerable value, and in case of fire, considerable damage may result in a very short time, which fact, together with the number of fires reported, causes some of the fire insurance companies to hesitate in writing any great amount of this class of business.

In the up-to-date exchanges, all cables are lead covered and enter the building through underground ducts, the metal covering of the cables being bonded and permanently grounded. From the underground, the cables are then brought to a cable rack built of angle iron and cross connected to the protectors—each line having a protector which is a combined lightning arrester, heat coil, etc., and it is generally claimed that lightning or high tension current is grounded as soon as it enters and seldom gets beyond this point. So called flame-proof wire is used for cross connections and the only wood is a small fanning strip for connections.

One large telephone company, in reply to my inquiry, stated that they had considerable trouble from lightning and foreign contacts, but not at the switchboard, the trouble being confined to the racks and aerial cables.

In my judgment, the placing of wires underground seems to eliminate practically all of the hazard from the electrical source, providing ordinary principles of construction are followed and that lightning and power conductors do not occupy the same duct or manhole.

Therefore it would seem wise, from the underwriter's standpoint, to place telephone exchanges in two classes, as follows:

Class 1—Exchanges with all lines entering from underground system of conduits.

Class 2—Exchanges with lines entering from overhead line construction.

NOTE—Some discrimination should be made between modern equipment and construction in both classes (See Rule 64, National Electrical Code for Requirements governing Telephone Installation.) Protective devices, no matter how efficient, cannot be considered equivalent to removing the source of trouble by placing wires under ground.

In conclusion, I will say: The more important and better class of telephone companies appear to be constantly striving for a higher grade of general construction, material and devices, and the chances for serious fires and burn-outs in Class 1, above referred to, appear very remote, but regardless of careful management, the action of the elements and liability of foreign contacts cannot be avoided and there is no positive assurance that protectors will perform their duty. Therefore, Class 2 must necessarily rate higher in order to secure sufficient premium to furnish adequate returns.

I have no information on hand as to the comparative losses between Classes 1 and 2, and in order to have both classes receive favorable consideration from the underwriters, it would appear to me that, all other conditions being equal, the rates on Class 2 should be, say 50 per cent to 75 per cent more than Class 1.

I trust the information given is what is desired, and that it may be of interest and some value.

Corporation Telephones in England

CORPORATION telephones, as you are no doubt aware, are not confined to Glasgow, and I shall begin by briefly sketching their present position in the United Kingdom. The first Independent telephone exchange constructed by any local authority was that of the States of Guernsey, which was established in July, 1898, and which is consequently in its seventh year of working. From a small beginning, it has developed until at the present moment there are 1,230 telephones at work in the island. As the population is only 40,300, this gives one telephone to every thirty-three souls, and makes Guernsey the best telephoned area in the United Kingdom. The rates charged are very low, but the financial results have been satisfactory. The accounts for the year ending 31st December last showed a net profit of £201, after providing for interest, sinking fund, and a special contingency fund. Orders continue to be received, so it is evident that even Guernsey has not yet reached saturation point.

The second exchange to be established was that of the Corporation of Glasgow, which commenced to work in March, 1901. That has also been extremely successful, as, beginning with promises for 3,000 instruments, it has now 11,200 actually working, with a stream of new orders always flowing. The last published accounts showed a surplus of over £2,000, after allowing for interest and sinking fund. Another financial year will end on 31st May next, when it is expected that a considerably larger surplus will be announced.

The third corporation exchange was that of Tunbridge Wells. The scheme was a very small one, providing only for 300 lines, as it appeared quite unlikely to the authorities, notwithstanding strong advice to the contrary, that that number could be exceeded for at least a very considerable time; but the success of the service was so great that 300 instruments were working within a few weeks of the opening, and in the course of a few months the number had reached nearly 900, which had to be grafted on a system which was originally far too small. The corporation exchange met with the most determined opposition on the part of anti-municipal traders and of the landed gentry in the neighborhood, and the outcry raised was so continuous that the town council, becoming alarmed and tired of the constant controversy, foolishly, in a fit of unreasoning panic, parted with their undertaking to the National Telephone Company. The terms they secured showed what a hold they had obtained, for they received £3,000 in excess of their alleged outlay, and secured a permanent flat rate of £6 per annum for their burgesses, together with the abolition of terminal fees on trunk calls and other advantages.

The fourth exchange to be started was that of the Corporation of Portsmouth, which was opened in March, 1903. From a small beginning, the exchange has prospered mightily and has at present some 1,700 telephones, with many others to join up, augmented daily by new orders. The first financial year ended on 31st March last, and the accounts are not yet available, but are expected to show a profit of about £1,000 on the first year's working.

The fifth exchange to get into operation was that of the Corporation of Swansea, which was opened in August, 1903, and has at present nearly 800 telephones joined up and many more to follow. Being of such recent erection, no accounts are, of course, available, but a good surplus on the first year's working is confidently expected.

The sixth exchange was that of the Corporation of Brighton, which was opened in November, 1903, and has now 900 telephones working, with about 1,000 more to join up. In this case also no accounts are, so far, available.

In Portsmouth and Swansea the schemes were carried out well within the original estimates. In Glasgow this is also substantially true, although the fact has been veiled by the alterations of, and addition to, the original plans determined upon by the telephone committee in view of the unexpectedly liberal support accorded to the undertaking by the public. Having made you acquainted with the present position of municipal telephony, I shall proceed to touch upon the manner in which the exchanges have been constructed.

The system in Guernsey was at first nearly exclusively overhead, as it was felt desirable to have the routes well defined before undertaking underground work. The poles used are creosoted Norway fir, of the usual sizes. A few standards have been erected on the roofs, but only where absolutely unavoidable. These standards are exactly the same as I designed for use in Glasgow in 1881, built up and spliced in the same fashion, and are fitted with the channel iron arms which I designed about the same period. The insulators used throughout are of the pattern known by my name, which also dates from 1881. These insulators, while being effective as such, resist the effects of stone-throwing much better than any other form, and are consequently well suited for country roads and districts. As the island is small, and no chance exists of long-distance trunk communications, it was decided to employ silicium bronze wire of an unusually small gauge, namely, No. 19, which electrically is quite sufficient for such a restricted area. It has a breaking strain of 153 pounds and a resistance of ninety-four ohms per mile. It was said when the exchange was first opened that such small wire would not stand the storms to which the island is subject, and would soon be eaten away by the salt air. These predictions have been completely falsified by results. The original wire, put up seven years ago, is still intact, and shows little signs of wear. It has withstood many gales with great success; interruptions to service through storms, even the most severe, are extremely rare. As the routes filled up and the subscribers increased markedly, it was deemed desirable to lay underground cables, and this policy has been followed, until the mileage of underground wire in the island is more than one-third that of the overhead; the respective mileages of metallic circuit at 31st December last being 318 miles underground and 827 miles overhead. The type of underground cable used throughout is air-space, paper insulated, the gauge of the conductors being No. 22. The cable is sheathed with lead in the usual way, and then armored with steel tape, finished over all with a serving of jute. I believe that these were the first armored cables ever used for telephone work, and the new departure, like most innovations, caused comment and adverse criticism; but the venture has been fully justified by results. It is nearly seven years since the first cable was laid, and although the mileage is now, as I have said, very considerable, not a single fault has occurred in any of the cables from first to last, and when uncovered the cables look as good as new, so that they have evidently a long life before them.

The switching system used in Guernsey is that known as the Bennett ring-through. This was originally patented in

[Paper by A. R. Bennett, read at a meeting of the Glasgow local section of the Institution of Electrical Engineers, April 12, 1904, with discussions by Herbert Laws Webb and other members, on that date and at a subsequent meeting of the Institution, May 10, 1904.]

1891, and put into use in a small way just before the death of the late Duke of Marlborough led to the New Telephone Company becoming merged with the National. The system has been fully described in Preece and Stubbs' "Work on Telephones," and in Joseph Poole's "Telephone Handbook," and in other publications, so that I need not describe it minutely. I will simply say that the leading idea is to obtain a ring-off signal quite distinct from any other. In the older systems great confusion arose through the operators being unable to discriminate between the different signals. In the ring-through system this is avoided. In the older systems, too, a subscriber could not ring his correspondent's bell without being disconnected, owing to the ring-through being mistaken for a ring-off. In the Guernsey system one subscriber can ring through to the other without making any signal at the exchange, the ring-off being unaffected until he makes the proper movement. This result is brought about by bridging the conductors in the connecting cords by two coils of equal resistance and taking off from between them a branch to earth through a battery. The ring-off signal may either be worked by the resistance coils arranged as electro-magnets or by a special indicator included in the battery circuit. It will be seen that the ring-off battery is always charging the lines connected by the cords, although no current flows until one or both of the subscribers touches his ring-off button, which has the effect of making a momentary earth at his end of the line. The current then flows from the ring-off battery and actuates the drop. This system requires well-constructed and well-insulated lines, because no earth or leakage is admissible, such, when it occurs, being indicated by the ring-off drop persistently keeping down. The system is, therefore, always under test, a fact which worked out to the great grief and dismay of the earlier line-men, who were accustomed, with great light-heartedness, to run wires in contact with trees and buildings; that cannot be suffered with this plan, so that a well-insulated and well-maintained system is a necessity. When there are more than one switch-room, as in Guernsey, the ring-off batteries must be of approximately equal strength, and all must be connected with the same pole to the line; they thus oppose each other until the ring-off signal is given, when they act in unison. The facility of being able to ring your correspondent's bell whenever desired is greatly appreciated, as it enables a conversation to be interrupted for reference to papers or other purpose and resumed at will without danger of being cut off at the exchange. If you choose to make the subscribers do their own ringing, you disperse an important part of the work amongst the multitude, who feel the burden not at all, instead of concentrating it in the switch-room, and by giving the operators more work to do, causing the switching to be slowed. This ring-through system has been adopted to a large extent on the continent and in South Africa. The system has fulfilled all expectations in Guernsey, where the service is generally considered as satisfactory. I need scarcely mention that all lines in Guernsey are on the metallic circuit principle. This applies to all corporation exchanges.

In Glasgow there are nineteen switch-rooms. In fourteen of these the ring-through system, practically the same as in Guernsey, is fitted, but in the remaining five switch-rooms, those in the central parts of the city, namely, Renfield Street, Hillhead, Bridgeton, Kinning Park and Queen's Park, the five chief exchanges, were constructed on the call-wire principle, in deference to the wish of the telephone committee, which, before a start was made, considered the question carefully. On three of these central exchanges, however—Hillhead, Kinning Park, and Queen's Park—ring-off drops on the ring-through system have been fitted so as to render it unnecessary for subscribers on those exchanges to call-off after a connection; they simply press a button, establish an earth connection at their instrument, and cause the central ring-off battery to work the indicator. This saves much time on the call-wire and leaves it clearer for those calling for connections. The same system will soon be in operation at Bridgeton, and the central will also be fitted later on. A new exchange, to relieve the central, will shortly be opened in Nelson Street, Trongate, which will be on the ring-through system entirely. The abolition of the call-wire system is under consideration, but, so far, nothing to replace it has been settled upon. The system has been much abused, but at the same time has many staunch friends. In intelligent hands it is possible to get through a series of connections quicker by the call-wire system than by any other, a fact that is of great importance to busy firms. On the other hand, the vast extension of the telephone system which has followed the introduction of corporation telephones has brought into communication a very large number of subscribers of an inferior class; of office boys and girls, of domestic servants and others who do not master or understand the importance of the working rules. These people neglect to call-off or fail to do something else essential, and so cause trouble and delay. This, in our case, has been accentuated by the desire of the corporation to render communications as private as possible. If operators were provided with tapping keys to enable them to cut in at any moment and ascertain the state of a connection by listening (a state of matters which exists on all exchanges but those belonging to corporations), the errors or omissions of subscribers could be largely neutralized, but this expedient is so distasteful that it has not, so far, been adopted. A telephone system is really a complicated machine, of which the subscribers are essential parts, and if they fail the machine is in danger of clogging. So it is becoming more and more necessary to make a telephone-system subscriber-proof or fool-proof, and a great step in that direction will be referred to when I come to describe the Brighton corporation system.

The construction work in Glasgow is to a very large extent underground. After the recently constructed Post Office system in London, the Glasgow corporation is the largest underground system in the United Kingdom, and that by a very long way. The form of duct employed is cast-iron socket-and-spigot pipes of three inches internal diameter, jointed by means of spun yarn and lead, and laid so as to be water and gas tight. At frequent intervals brick manholes have been built, and in many other places split cast-iron pipes, with the flanged halves bolted together, are put in for the purpose of taking off branches. With the object of avoiding re-disturbance of streets, the telephone committee wisely determined to lay a very large number of spare pipes. That policy has been completely successful, as, notwithstanding the great increase which has taken place in the number of lines, it has not so far been necessary to reopen any important street. But owing to the large amount of capital which has thereby been left unremunerative for a time, occasion has been given for critics to assert that the estimates have been largely exceeded, but this, when the facts are taken into account, is found to be a complete myth. Recently in some of the outlying districts, on routes where a single duct is sufficient, three-inch stone-ware pipes with socket-and-spigot joints have been used, but these are of very insignificant extent as compared with the mileage of iron pipes. Care has been taken to connect the iron pipes electrically with the tramway rails at points where a difference of potential is found to exist, with the view of avoiding electrolysis. The use of iron pipes is in itself a safeguard to the cables, as any electrolytic action will first affect the iron pipe, and the lead-sheathed cable within will be protected until the pipe is eaten away. This is one of the advantages of iron as compared with stone-ware. But, owing to the precautions

taken, there are no signs, so far, in Glasgow, of any damage being caused by electrolytic action on the pipes or cables. The ends of the iron pipes are connected across in manholes by substantial conductors, so that there is no interruption of electrical continuity when a manhole occurs.

In the suburbs cast-iron pillar boxes, containing air-tight joint-boxes, are used instead of manholes. These, being painted red, are occasionally mistaken for letter boxes, and it is an amusing sight in Pollokshields sometimes to see servant girls walking round them vainly endeavoring to post letters in slots which do not exist.

The cables used in Glasgow are of two kinds, armored and unarmored. They are all air-space, that is to say, the conductors are insulated by loose paper wrappings, each pair of conductors being twisted together to form a metallic circuit. These metallic circuits are then laid spirally in layers, each successive layer being reversed, the number of layers varying with the number of pairs contained in the cable. This number varies from two pairs to 312 pairs, the last being contained in a diameter of 2.75 inches. The core thus built up is covered with lead, which varies in thickness from .1 to .16 of an inch, according to the size of the cable. The insulation resistance required at the factory is 7,500 megohms per mile, and the insulation required after laying and jointing is 500 megohms. No. 22 conductors are used within a half-mile radius of an exchange, and these give a capacity of .07 of a microfarad per mile. Beyond a half-mile distance No. 20 conductors are used, and these give .08 of a microfarad. The greatest number of pairs that can be got into a cable of 2.75 inches diameter when No. 20 gauge used is 217. For the purpose of facilitating testing and jointing, the different layers in a cable are marked by differently colored threads wound spirally round them, always starting with the same color at the core, the seventh layer being of the same color as the first. Each layer also contains one pair done up in differently colored paper from the rest. These cables are drawn into the three-inch iron pipes and are sometimes joined in the manholes direct to one or more branch cables, but in Glasgow are generally taken into joint-boxes fitted with air-tight covers to facilitate distribution. The cables in the manholes are fitted with nozzles, through which air pressure can be applied by means of a hand-pump; all joints are tested in this way before being passed as satisfactory, and the joint-boxes are also frequently subjected to air-pressure tests. At the central exchange air-pumps, driven by electromotors, are provided by means of which air pressure can be put on any of the cables at will, the air being first passed through drying pipes containing chloride of calcium. The air under pressure finds its way through the loose paper insulation, and, being dry, absorbs any moisture that may be present, and discharges it at a distance where an opening is purposely made to allow its egress. The air pressure is felt at very considerable distances, as far, for instance, from the central as Maryhill. If a puncture exists on a cable the application of constant pressure inside prevents any moisture entering through the fault, and so keeps the cable working under circumstances which, without pressure, would speedily prove fatal.

In Glasgow, to a very large extent, the underground cables are taken into subscribers' premises in the same way as gas and water. This is a more expensive method than was contemplated in the original estimate, but when once done is much freer from disturbances than the ordinary overhead wires. Away from the center of the city such a method of distribution would prove extremely costly, and the usual method followed is to lead the underground cable up a distributing pole, or to a distributing standard on a roof, there making what is called a pot-head joint, and connecting the underground metallic circuits to overhead distributing wires by an intervening link of wire insulated with vulcanized india rubber, protected by waterproofed braiding. A pot-head joint consists of a leaden sleeve or cup, soldered onto the lead sheathing of the underground cable. Inside the sleeve the paper-insulated wires are jointed to the india rubber insulated wires, and the sleeve then filled up with melted compound, which is kept heated until all air bubbles have been expelled, and is then allowed to solidify. The sleeve is protected from the weather by a cap, and also by a wooden box; when well made a pot-head joint of this description is quite air-tight, and will last an indefinite period. It, however, requires considerable skill and intelligence to make a good job. The cable employed for branches into buildings and to distributing points is armored with steel tape, as I have described in connection with Guernsey. It is laid in a creosoted wooden box of rectangular section. The armored cable, being very flexible, lends itself readily to distributing purposes, and the creosoted wooden box can be easily adapted to corners by sawing. The combination is very successful for the purposes for which it is used, and no accidents of any importance have occurred with armored cable since the Glasgow exchange was started. There have been several instances of cables being pierced by spikes driven by careless excavators, but then similar accidents have happened to cables laid in iron pipes. In two instances spikes have been driven clean through a three-inch cast-iron pipe, transfixing the cable inside. It is clear, therefore, that the mere act of putting a cable in a pipe, however strong, does not absolutely secure it from injury, and the accidents to armored cables have been so few and so insignificant as to fully justify its continued use.

The insulators used in Glasgow are of the same type as in Guernsey, except that on the longer lines double-shed insulators are employed. Bronze wire is used for distributing purposes, but the gauge is No. 18, weighing forty pounds to the mile. It has a breaking strain of 200 pounds and a resistance of forty-five ohms per mile. On junction lines, such as those to Bearsden, Stepps, and other outlying places, hard-drawn copper wire weighing 100 pounds to the mile and having a breaking strain of 330 pounds is the standard. In the overhead distributing wires to subscribers' premises, no twisting or crossing is employed, that being found to be unnecessary. On the junction lines metallic circuits are crossed at intervals of a mile or less, according to the plan I elaborated in the early eighties for the original Scottish trunk lines, and this crossing is found to be sufficient for all purposes. The system of twisting overhead loops is expensive to carry out, and renders the discovery of faults, and the restoration of wires after being broken down, an extremely arduous task. With the system of crossing all these difficulties disappear.

The poles used for distributing are generally of creosoted wood, but sometimes they are of square pitch pine, and more rarely of steel tubes. At terminal poles, where all the pull is on one side of the insulator, what are known as J bolts are employed, which prevent a twisting strain being thrown on the wooden arm. These wooden arms are usually of oak, but recently we have tried karri wood, which promises to be very successful. Sometimes an effort is made to give an ornamental appearance to the pole by means of wrought-iron brackets. Where roof standards are employed, they, with their fittings, are all of the same type as in Guernsey. Recently an ornamental iron finial has been adopted for the poles and standards; this also acts as a lightning discharger, as the earth wire, with which all poles are fitted, is fixed in direct metallic connection with it.

Wherever possible, the hanging of overhead wires above the tramway trolley lines is avoided. This cannot be done by going underground without incurring great expense when there are only one or two subscribers to serve. In such a case a small cable made up of vulcanized india

rubber-insulated wires and containing a stranded steel core, is used, the core being sufficiently strong to support the span. In the unlikely event of a break the falling of the insulated cable across the trolley is followed by no evil effect.

At the exchange the underground cables are first taken to a room fitted for air-pressure tests, as already described, and are thence continued to the cross-connecting room. Here the cables are terminated in pot-head joints, and the wires are distributed to test-jacks mounted on one side of an iron frame, to which they are permanently fixed. To the other side of the frame are attached the lightning and high-tension guards, to which the cables from the switchboard are permanently connected. The test-jacks and the guards are joined by single pairs, which can be shifted in the event of any alteration taking place in the subscribers' numbers, all transpositions being effected between the test-jacks and the guards so as to leave the cable wiring permament on both sides.

The switchboard used at the central exchange is designed for 10,000 subscribers. At the present moment nearly 7,000 stations are served from it. It is of simple design, because the call-wire system renders it possible to make everything in the exchange of much greater simplicity than is practicable with any other system. The switchboard is flat, so that operators may sit on both sides, an arrangement which saves a large amount of floor space, a material consideration in the center of Glasgow. The jacks are two-point only, with a third connection for the test circuit. They are arranged vertically, but no trouble is experienced from the accumulation of dust, the danger of which is sometimes urged as a strong objection to vertical jacks. The cords and plugs are hung from a canopy suspended from the roof so as to leave a clear space for the operators' hands. The cords contain three conductors, two for the metallic circuits and one for the test circuit. At the sections of the board devoted to junction line working the cords are single for the service of the incoming junction lines. The outgoing junction lines are distributed amongst the operators, who are provided with speaking-keys, by means of which they can ask connections from the various outlying switch-rooms. The operators' sets are of the pattern first made to my instructions for the Mutual Telephone Company of Manchester, in 1891, and consist of a head-gear receiver with a transmitter fitted on a breastplate hung around the operator's neck. By moving the mouthpiece the operator is able to cut the speaking battery out of circuit when not required. This arrangement for hearing and speaking leaves both hands free for manipulating cords and keys, and the good results it gives have led to its practically universal employment throughout the world. The method of disposing of the multiple cables is, I believe, unique. One objection to the usual type of flat switchboard is the difficulty of stowing the multiple cables, which are generally contained in the table itself, and are consequently inaccessible. At the central exchange the multiple cables are laid on either side of the switch-table, under movable flooring, in guides which are so arranged that any particular cable can be located without difficulty. All trouble as regards accessibility is consequently prevented. The connections to the spring-jacks are taken off at the proper intervals and led under the flooring into the body of the table, and thence up to the spring-jacks, sufficient spare cable being provided to enable the spring-jack strips to be taken out, examined, and readily repaired. The spring-jack strips are very accessible, as they can be readily slid sideways and opened out for inspection. As a matter of fact, however, the faults are extremely few, and it is not often necessary to meddle either with the jacks or the cables.

The same type of switchboard is used at the Bridgeton, Hillhead, Kinning Park, and Queen's Park switch-rooms, but these switch-rooms being on a much smaller scale, it has not been necessary to make any special provision for the cabling, which is readily contained in the bodies of the tables. These branch switch-rooms, however, differ from the central in having the ring-off indicators fixed to the canopies, the ring-off drops coinciding with the pairs of cords. At all other switch-rooms vertical boards are employed, on the ring-through system, as already described. The largest of these is at Govan, which serves 232 stations.

The subscribers' instruments are provided with an unusually powerful magneto generator, which contains four permanent magnets, and is capable of ringing a bell audibly through a resistance of 25,000 ohms. The speaking set is invariably of the hand micro-telephone description. It has been found advisable to omit the finger battery key, which is frequently a feature of these sets, owing to trouble arising from domestic servants and others not well acquainted with telephone working, omitting to press the switch when using the instrument or only pressing it intermittently. Any subscriber, however, who desires it is furnished with a finger key. Every effort has been made to secure the best workmanship in the instruments, and the results obtained have been extremely satisfactory. Every subscriber's office is furnished with lightning and high-tension guards, the latest patterns of which are mounted on china, so as to be quite uninflammable. The corporation has nearly 250 public telephone offices in use, most of which are fitted with a penny-in-the-slot collecting machine, by means of which the fact that a penny has been dropped in is signaled to the operator at the exchange. This is done by a contact arm divided into segments, which make contact with the coin and produce a number of makes-and-breaks in the operator's telephone. At the central the public telephone lines are brought to a separate switch-table, as the checking of pennies is apt to interfere with the rapid work at the main board. Connections are got between the public telephone switchboard and the main board by means of junction lines and speaking keys. The public telephones are used very largely and provide for a traffic which continually grows.

The ringing of subscribers' bells, when necessary, is effected by means of magneto-generators driven off the electric lighting mains. One generator is used for the central and another supplies current to the principal branch exchanges by means of metallic circuits specially reserved for that purpose.

Turning now to the Portsmouth Corporation Telephone Exchange, there is little to differentiate it from Glasgow, except as regards the switching system. Cast-iron pipes are used for the ducts; the cables and manholes are to the same specification; the distributing poles are similar, and the bronze wire employed for distributing is No. 18, of the same specification as in Glasgow. Hard-drawn copper wire is used for the junctions, and Portsmouth possesses probably the longest junction route in the country, as, in order to reach Gosport, which is only distant half a mile across the harbor, a circuit of nearly twenty miles has to be made. This is owing to the inadaptability of the bottom of the harbor for submarine cables.

The Portsmouth switching system is the same as in Guernsey and the branch exchanges in Glasgow, except that the calling is not done by a magneto-generator, but by a central battery at the exchange, which is brought into operation by putting an earth, by means of a finger key, onto one leg of the subscriber's line. This causes the subscriber's line indicator to be operated until the operator plugs into the answering jack, when it is automatically restored to its neutral position. The wiring of the multiple jacks on the Portsmouth board is somewhat of an innovation. The spring-jacks consist of two pairs of springs, an inner pair and an outer pair. The outer pair of springs is in parallel

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circuit with the subscriber's line, and all speaking is done through this outer pair of springs. The inner pair of springs of the several jacks are connected in series, and the last spring is permanently earthed through the indicator and the central battery. The insertion of a plug in any of the jacks on a subscriber's line connects the operator's set to the line and at the same time causes the inner pair of springs to open and to interrupt the indicator circuit, so that the indicator is cut out wherever an operator plugs in or two subscribers are connected. This device answers very well and saves much complexity, because the usual American practice is to cut the indicator out by means of a relay worked off the test circuit. This is clumsy and expensive and imports into the switchboard a multiplicity of relays, which are very fallible pieces of apparatus. Each operator's position is fitted with a pilot indicator, known as a "star," which is connected in a local circuit with all the ordinary indicators, and shows up prominently and makes a sharp click whenever one of the ordinary indicators on a position becomes deflected. Instead of these pilot indicators, relays and ruby-colored lamps have been tried. They answer very well, but being quite silent are more liable to escape the operator's notice.

The central battery consists of a duplicate set of Hart accumulators, from which not only the calling, but the speaking circuits are worked. These are charged by a motor-generator driven off the electric lighting mains. A separate generator is used for ringing purposes during the day, but during the night the alternating electric lighting current which is used in Portsmouth is employed for ringing the alternating bells, being transformed down by an ordinary translator.

The Swansea Corporation telephone system is exactly the same as at Portsmouth, except that glow lamps are added to each operator's position, which indicate when an unusual flow of current is passing over the lines joined to that position. This enables any leakage on the outside lines to be very speedily localized. The underground and outside work at Swansea is the same as at Portsmouth, the ducts being three-inch cast-iron pipes, and the cables, poles, insulators, and wire being to the same specifications.

At Brighton several deviations were made from previous practice. The underground ducts in the central district consist of four-inch octagonal stone-ware pipes laid in cement concrete, the joints first having been covered with adhesive tape. The laying, jointing and alignment of these octagonal ducts require much greater care than the laying of iron pipes, but when once finished satisfactorily they make an extremely good job. In the outlying districts in Brighton, where only one duct is employed, a three-inch cast-iron pipe is laid. Apart from this, the outside work is the same as in the other places.

The switching system employed, however, although essentially on the same plan as at Portsmouth and Swansea, differs in an important detail. In those places the exchange is called by pressing a button. At Brighton the exchange is called by the act of lifting the telephone from its rest. This is effected by means of a passing contact attached to the switch-arm, which, when the telephone is lifted off, momentarily earths the subscriber's loop. This momentary earth causes a current from the central battery at the exchange to flow and bring down the signaling indicator. This indicator is restored to its normal position by the act of inserting the answering plug, the indicators being combined with the spring jacks, so that the insertion of a plug mechanically restores the shutter. The operator then takes the message and makes the connection called for, at the same time ringing the called subscriber's bell by means of a finger switch. The switch-cord is divided into two portions by the insertion of a translator, which insulates the one subscriber's line from the other and causes all speech exchanged between them to be effected by induction. A ring-off indicator on the usual ring-through principle is bridged across the cord on each side of the translator, one drop being colored red and the other yellow. When the called subscriber lifts his telephone off to reply, the yellow drop falls and shows the operator that the connection is effective. By touching a button she restores the shutter of the yellow drop. When the subscribers are finished they both place their telephones on the rest, an act which operates a passing contact in the opposite direction and brings down both the yellow and the red drops, and this is the signal for disconnection. The ring-through principle is maintained, so that if the called subscriber does not answer promptly, the caller, by turning his generator handle, can ring his bell as often as is necessary. This system is as near fool-proof as is possible, as the subscribers are not left to touch buttons or turn handles for the purpose of calling-on or ringing-off, the natural actions of lifting off and putting back the telephones accomplishing these purposes. With the exception of the second ring-off drop, this system is in accordance with a patent which I took out in 1891, and which has never hitherto been put into practical use owing to the difficulty of constructing a really trustworthy passing contact, and also the difficulty of combining such a system with a ring-through arrangement. Both these difficulties have now been successfully overcome, and I am pleased to say that the Brighton exchange is giving the greatest possible satisfaction to the subscribers. The other arrangements at Brighton are identical with those already described in connection with other centers.

The only other system remaining to be referred to is that of the Corporation of Hull, which is now in course of construction, and is expected to be in operation in June or July. The ducts used there are of the socket and spigot type, with Stanford joints, a pattern which has been successfully used in Hull both for the electric light and tramway systems. They are four-inch diameter within half a mile of the exchange, where the largest-sized cables will prevail, and three-inch diameter beyond that distance. The switching system will be identical with that employed at Brighton, and the other details, both outside and in, will be the same as in the other centers.

A spirited discussion followed the reading of Mr. Bennett's paper, in which several members took part. The first to speak was Herbert Laws Webb, who said:

I consider the subject has been approached from the wrong side. The question of telephoning a city is the question of handling the telephone traffic of that city. That is an engineering question, and I do not find in any one of Mr. Bennett's reports, or in his paper itself, any mention of the real question—the question of handling the traffic. What a telephone exchange is built for is to make telephone connections. What you want to get is the best, quickest, and most economical telephone connection. Now, Mr. Bennett has worked the wrong way about. He has fixed a rate in advance, and then tried to make his system fit his rate. The proper method of working the thing on engineering lines is to find out what the service is to cost, and then fix the rate. As a general rule, the whole question has been put on the basis of making a rate of about £5, and making the average capital cost, ranging from £14 or £15 a line up to about £20 a line, and this has been put forward in such a way that the engineering, the real engineering, question has been entirely omitted. Now, this class of work, this method of putting forward the telephone problem, has led to the adoption of poor telephone engineering methods, and you will notice all through this paper descriptions of systems which make the telephone subscriber the operator. That is entirely a wrong way of approaching the question of handling the telephone traffic of a great city. The subscriber himself should not be the operator at all. The least possible amount of work should be left to the subscriber to do, and the work should be done by the expert who is the operator at the exchange. We have in the municipal exchanges the call-wire system and the ring-through system. These are the principal systems which have been described. Now, the call-wire system is open to very many objections. It seems to me at this late day almost absurd to have to stand here and tell you all the objections to the call-wire system, but since it has been adopted in Glasgow, and has been held up as a modern and up-to-date system, giving an efficient service, I think it is only proper that some of them should be pointed out.

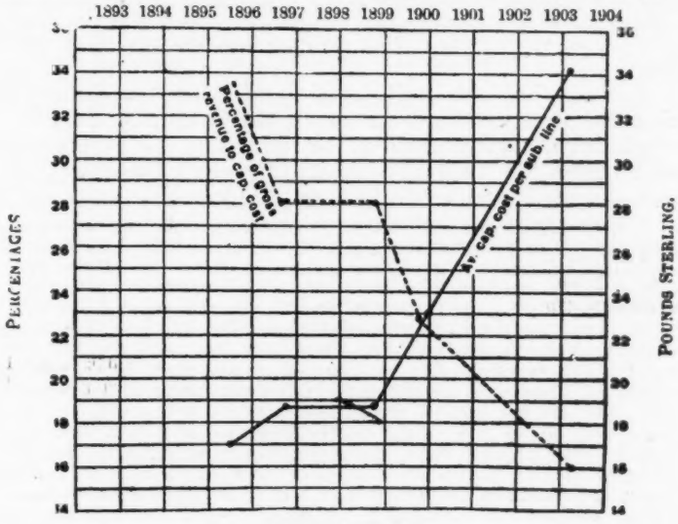
In the first place, it has the very grave objection of making the subscriber the operator, or relying upon the subscriber to do part of the work that should be done at the exchange. Then it involves the use of two sets of lines. The subscriber's service is dependent on two sets of lines being in order. It increases your plant at the most costly part, which is the line plant. That results in a mixed system, because when you get to your small exchanges, where your subscribers are scattered, it becomes too expensive to run round the extra line for a call-wire, and you revert to some system of direct signalling, which results in your having in the same general exchange area more than one method of working. You have a man using the telephone in a different way, say, in his house, from the way he has to use it in his office, and that will give you a great deal of bad service, because people won't remember to do different things in different places with their telephones. Then a very great objection to the call-wire system is the double use of numbers. A subscriber has to give two numbers.

Now, one of the very great difficulties in handling the traffic of a large telephone system is the difficulty caused by the errors that occur from "wrong numbers." We all know that when you use numbers very much you are apt to make mistakes. You are apt to transpose the figures, to repeat the figures in the wrong way you have read them off from the book, and that error is increased very much if you have to say off two sets of numbers, to memorize the number you are going to call, and say your own number as well, so that the percentage of errors due to wrong numbers, which is one of the most annoying errors in the telephone service, is much increased by the use of the call-wire. This question of numbers is so important that in New York they have recently decided not to increase a telephone exchange above 10,000 subscribers, so as not to get numbers of more than four digits. It was felt that if numbers of five digits were in general use serious evils would arise from confusion and transposition of numbers from using such long numbers, and that the time of the operators and of the plant would be materially drawn upon in repeating such long numbers. Now, in working by the call-wire, and especially with all the "party reds" and "party blues" and "y's" and "x's," and so forth, which you have in the Glasgow directory, you must get very long numbers in the working of the Glasgow municipal system. That is a great difficulty. Then, of course, it makes the junction working more awkward. The operator has temporarily to abandon listening to the call-wire while she is working through the junction call. At the busy times, of course, that is a disadvantage. At the busy times of the day the work both for subscribers and for the operators gets very trying. With several people trying to struggle through at the same time the strain on the operator is hard, and the strain on the subscriber is hard.

Another great difficulty in working the call-wire system is that it makes what we call team work impossible. A very high standard of service is only maintained, and a very rapid average answer is only maintained when you get operators helping each other. That is, the operator at either side of a given operator helping her neighbor. When a call comes in opposite this operator, and she is already engaged, the next operator takes it up, and by that team work you get a very high average of efficiency, and a very rapid average answer. With a call-wire, where subscribers are grouped so many to an operator, of course, that is impossible. Again, it makes the supervision of the service impossible. You can only get very high efficiency if you can supervise your operators by means of supervisors and monitor operators. With a call-wire system you have no signal, so that you have no supervision. Now, the call-wire system was abandoned a great many years ago practically everywhere except in municipal telephony, and it seems to me quite an extraordinary thing that it should have been adopted in 1900 as the basis of a modern telephone system. Now, the call-wire in Glasgow is combined with the ring-through system, and the ring-through system is also a very disadvantageous system when you come to consider the economy and efficiency of telephone operating. In any given connection you have a certain amount of time spent on the work of getting the connection through and getting the lines disconnected when the conversation is finished. That time is time spent by the operator, to a certain extent, and time spent by your plant. If you add to that time unnecessarily, you waste the time of your operator and of your plant. That is a very important point, which seems to have been overlooked.

When you have a large system, as you have in Glasgow, with many junction wires, you have got to cut down as much as you can the operating part of the average connection so as to save the time of your plant and get the most out of your operating labor. Now, if you have any system which depends on the subscribers as the operators, which depends on the subscribers especially to call off, and to ring his correspondent, and so forth, you must necessarily get a lot of waste time. Further, you find that the ring-through system almost invariably—I suppose invariably—develops into a "ring-back" system. Your subscribers get so much accustomed to ringing each other that many of them always answer a ring by a ring, and you have many people every day going through the idiotic performance of ringing to and fro at each other two or three times before they get together on the telephone. That must involve a tremendous amount of waste time on the average connection. You will only get a rapid connection, quick working, a minimum amount of waste time and waste of labor on each average connection when you get automatic signaling.

I know telephone men, as a rule, are very much interested in their profession and in their work, and I think some of these points will certainly interest you. Now, in New York, under magneto working—that is, calling and ringing-off by magneto—the total time of operating a local connection was 44.7 seconds. That is made up of 27.6 seconds from the time the first subscriber called to the time the called subscriber answered. All those tests were taken in that way. That represents the time that the calling subscriber has to wait until he gets his correspondent. Of course, the actual operation of connecting, of inserting the plug, takes very much less. These figures include the delay of the called subscriber in answering, but as that represents the service that the subscriber receives, that is the time we always take—27.6 seconds up to the time the called subscriber answers, and 17.1 seconds from the time the conversation was finished to the time the two lines were disconnected and returned to their normal condition. That represents the actual time of the operating on the average connection, and although that 17.1 seconds for the disconnection no doubt seems to you slow, the reason for that is this—that the magneto call-off involves the subscriber remembering to ring off, and in any system where you make it a charge upon the memory of the subscriber to ring off you have many subscribers who won't do it, who habitually fail to do it. That necessarily sends up the average length of time during which the lines are left connected after the conversation is finished, because you


1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904
Percentage of gross revenue to cap. cost
Av. cap. cost per sub. line
PERCENTAGES
POUNDS STERLING.

CURVE DIAGRAM.

have many times, when the call-off signal is not given—it occurs thousands of times a day in Glasgow on both systems—and consequently those lines are often left up two, three, five, or ten minutes, and on a large number of tests those long periods send up the average. Well, now, five years later, when the common battery system was uniformly in use in New York—with a uniform method of working all over the city—the time was reduced to this—the time of connection, that is, to the called subscriber's answer, to 23.7 seconds, and the time of connection came down from 17.1 to 2.8 seconds. In the common battery system the subscriber cannot forget to ring off, because all he has to do is to put the telephone back on the hook. Now, you see the gain in time is very great—in the total time of operating the connection, and when you come to a junction call, it is found that with the common battery working the total gain in the operating of each average connection is 34 seconds. You must apply that to the daily traffic of the system, and you will see that you get an enormous aggregate gain in time every day, and that gain is spread over your operating time and over the use of your junction plant. It increases the capacity of the operator and the capacity of the junction wires.

In any large system economy in the use of the junction wires is a very important item. It is not too much to say that with uniform common battery working you practically double the capacity of the operator. When you consider that there are telephone systems to-day, several of them, where the average daily traffic amounts to over half a million calls, any such gain as that of thirty seconds on every average call means an enormous aggregate gain in the day's traffic, and consequently an enormous gain in the efficiency of the service to the subscribers and in the economy of the service. I contend that all these antiquated notions that involve making the subscriber the operator are bad telephone engineering. They miss the fundamental point of the whole thing, which is to make your average connection as quickly and as economically as you can. There is only one other point that I particularly wanted to mention as dealt with directly in Mr. Bennett's paper. He alludes to the large amount of surplus plant in the shape of ducts put down in Glasgow. That is one thing on which I have always contended that

Mr. Bennett's general view of the telephone business is deficient. You must have surplus plant. You cannot lay out any big system, any system for a big city like Glasgow, or even a smaller city, without reckoning with surplus plant. You cannot do without it. It does not matter even whether you grow or not, you still have to have surplus facilities to handle your business. In the first place, you cannot put down telephone plant except in large units. You cannot build it up, the style of wire we use to-day, wire by wire. You have to put cables down by the hundreds of pairs of wires. You have to build your switchboards by sections of hundreds or of thousands, so that you must always be ahead of the requirements of the moment. If you are going to have a flexible system, so as to take on subscribers in all parts, you must have spare capacity in all parts, and when you get partly filled up you find your subscribers are not stable. They don't always stay in the same place; some of them give the service up altogether; some of them die; some of them go away; some of them fail in business or remove to another town, and consequently you have people constantly giving up, and the people coming in don't always come on in the same places. You have also removals, and as you cannot move the line you move the instrument and attach it to another line. This leads to one man for the time being using two lines. You must always have a margin of surplus facilities if you are going to take care of your business in a proper manner, and that is a feature of the telephone business that you cannot get away from; that is one of the things that make the real cost of carrying on the telephone business higher than the apparent cost. Unless you count on having a margin of surplus plant your estimates will, in the course of time, be falsified, as I contend the forecasts of the Glasgow estimates have been falsified.

The meeting then adjourned until May 10, at which time the Glasgow local section of the Institution of Electrical Engineers met again in the same place. As there was no business the discussion on Mr. Bennett's paper was resumed. Mr. Webb again took up the discussion, and said:

Mr. Chairman and gentlemen, the paper says that the assertion that the estimates for the Glasgow Corporation have been largely exceeded is a complete myth, for the reason that the telephone committee wisely determined to lay a very large number of spare pipes, thereby leaving a large amount of capital unremunerative for a time. No figures are given in support of this assertion. At 31st May, 1903, there were thirty-two miles of spare duct out of a total of 127 miles. This is twenty-five per cent of surplus duct, by no means excessive. The total value of the thirty-two miles of spare duct was about six per cent of the total capital cost. The effect of this spare duct on the cost of the system seems to have been over-estimated in the paper. There have been so many estimates for the Glasgow system that I am not sure which is referred to in the paper, and to make the matter clear I have prepared a curve showing the various estimates which Mr. Bennett has made from time to time for a telephone system for the Glasgow Corporation and the actual results at the present time, as nearly as they can be ascertained from the published accounts and statistics. I have also shown a curve for the ratio of gross income to capital expenditure. The estimates start in 1896, when the average capital cost per subscriber was placed at £17. and the rate at £5 15s. giving a percentage of gross revenue to capital cost of nearly thirty-four. In 1897 the estimate of average capital cost per subscriber became £18 16s, and the rate £5 5s, bringing the percentage of gross receipts to capital down to twenty-eight. This estimate, Mr. Bennett maintained, was correct up to some time in 1899. In 1900 the estimate became £23 1s per subscriber, and, the rate remaining at £5 5s, the percentage of gross income to capital dropped to twenty-three. At the present time the actual average capital cost her subscriber's line is over £34, and the percentage of gross income to capital expenditure is sixteen. That curve shows, I think, where the myth really is.

Speaking of cables, the paper says that the largest number of pairs that can be got into a cable of 2.75 inches diameter with No. 20 gauge conductor is 217. Four hundred pair cable with No. 20 conductor, 2.75 in diameter, has been standard practice for some years. Touching on cables, as far as I understand the descriptions I have heard of the method of distributing employed in these Corporation telephone systems, I would say that it is on a wrong principle altogether. A multiplicity of sizes of cables is used, and the cables are pieced out by three, four, five and even eight-way joints so as to taper down to a very small number of pairs at the distributing points. This is a very wasteful and expensive way of laying out a telephone distribution system. It involves frequent changes at the joints and much spare plant through the whole length of the conductors. The modern method is multiple distribution—large main cables with distributing cables branched off in multiple at different points. This gives great flexibility, as the same pair of conductors can be picked up at any one of several different points. It enables the use of large main cables, and it gives the spare capacity where you want it, in the distributing plant.

Mr Bennett, in devoting his energies chiefly to what I call the promoting side of the telephone business, has neglected to post himself on the advances in telephone engineering. Consequently the march of progress has left him a decade behind the times. The paper contains clear proof of this. It shows that municipal telephonists have been engaged in learning the telephone business all over again. I mentioned some of the objections to the call-wire system, though by no means all. Look where the original mistake of adopting the call wire has led the Glasgow Corporation telephones within the short space of three years. You have six different methods of operating in the one system as follows

(1) Call-wire call and call-wire: call-off;
(2) Call-wire and push-button call-off;
(3) Push-button call and push-button call-off;
(4) Magneto call and push-button call-off;
(5) Magneto call and magneto call-off; and, finally,
(6) Automatic signaling on the party lines.

This variety of methods or working must lead to many cases of bad service daily. It is also a grave disadvantage internally, as operators have to be trained to do different things in different places, and workmen have to be trained to take care of a quantity of different apparatus. Uniformity of working is important both for efficiency and economy. There are several references in the paper to secrecy. This question of secrecy is a fetish which leads to undesirable technical methods. Where you have speech you cannot guarantee absolute secrecy. If you had a telephone system guaranteed to be absolutely secret, it is precisely to that system that unscrupulous people, desirous of discovering important secrets, would resort. With the systems described in the paper, excepting the call-wire system, it is quite easy for the operator to listen if she wishes to by plugging into the multiple jack of the calling subscriber. On the other hand, it is a mistake to assume that the telephone operator is an intentional or dangerous eavesdropper. In a properly managed exchange intentional listening on the part of the operators is a negligible quantity. No real advantage, therefore, is gained by keeping the operator out of the circuit, but it is often a great disadvantage. Often you want the assistance of the operator to get two subscribers properly into communication. This occurs with new subscribers and with public station customers. New subscribers and inexpert public station users you have with you every day. Frequent tapping in to supervise the connection was certainly an objection in the old days, but with a modern system the supervision is done entirely by means of the lamp signals, and tapping in is unnecessary.

The author says that the cut-off relay is clumsy and expensive, and that relays are very fallible pieces of apparatus. It is hardly necessary to defend the relay system against such superficial criticism as this. The relay system is in use for a million telephones, and gives a most reliable and efficient service. If that were not sufficient proof that telephone relays are trustworthy instruments, it might be pointed out that in several of these Corporation switchboards relays are used in important circuits. As to being clumsy and expensive, the cut-off relay occupies .0052 of a cubic foot and costs about 5s. Now, what expedient does Mr. Bennett resort to in order to avoid using this clumsy, expensive, and fallible relay? He reverts to a series jack—a very bad form of jack, supplanted in good practice for large switchboards more than ten years ago. This arrangement has several disadvantages. The use of a line indicator self-restoring by gravity involves the subscriber keeping the button pressed down until the operator answers. Many telephone users will give only a momentary pressure, and consequently will give only a momentary signal, which leaves no trace. Then the use of series contacts in the jacks to cut out the line signal is a defective method. It adds to the cost of the jacks and switchboard wiring. In a large board this increased cost would amount to more than the price of a cut-off relay. The series contacts in time will fail, and the subscriber will be unable to signal the exchange. To correct the fault you have to get at the innermost part of the jack. In a large board the use of this extra wire will give an unbalanced leg on the line, which will be sufficient to cause cross-talk. In the Brighton board this same device of series jacks, the disadvantage of which can hardly have been thoroughly considered before adoption, is used, although there the line drop is mechanically restored by the insertion of the answering plug. The great advantage of relays over any of the expedients described in the paper is that relays mean lamp signals. Lamp signals have been used in telephony for the past twelve or thirteen years. They have many advantages. They give a more accentuated signal than indicators, and occupy less space on the switchboard. They are noiseless and extremely simple and reliable. If you were to sweep away the tangle of different methods in the Glasgow Corporation system and adopt the relay system throughout you would get, not only a vastly improved service, but a much more economical service, as the present number of subscribers' lines could be worked with about half the present number of operators.

The Brighton system is described as being a great improvement. It is a great improvement in municipal telephony, but automatic signaling was standard practice before the first of these municipal exchanges was begun and could have been adopted in the first of them. The methods used in the Brighton system are far in arrear of standard practice. Indicators are used instead of lamps. The method of controlling the signals by a fleeting earth will lead to many false signals. Although two supervisory signals are provided, that of the called subscriber is thrown when the called subscriber answers, and has to be restored by the operator to place it in position to give the clear-out signal at the end of the conversation.

This will lead to many operating errors, as in busy times the operators will forget to restore the signal immediately after the called subscriber has answered. If the calling subscriber then inadvertently drops his supervisory signal, or if the signal is dropped by a contact, the operator will clear out and cut the subscribers off. The Brighton system is arranged so that subscribers can ring each other. With automatic signaling it seems wasteful to place a generator at every station, especially as the exchange is equipped for the operators to do the ringing, which, by the way, is much the more practical and economical arrangement. But with automatic signaling and ringing through you get into another difficulty. All telephone users who ring through are accustomed to replace the telephone or to hold the hook down when they ring. At Brighton this will throw a signal. Many operating errors will arise in this way.

Corporation telephones are in competition with the National Company, and the only way that the competition can be won is by better service and higher development, and the only way that you will get good service is by sound engineering and by a scientific study of the problems of telephony.

Mr. Gill was the second member to take up the discussion. He said:

With regard to exchange equipment, I want to state that the equipment of an exchange is not, as some people unacquainted with telephone engineering suppose, a detail. It is the essential part of the service, and upon the decision as to what type of exchange equipment shall be adopted depends the design of the whole system. In Mr. Bennett's paper there is a remark as to the fallibility of relays, and I attach a great deal of importance to that remark. Mr. Bennett talks about the "usual American practice," and he can only be referring to the central battery system, and the central battery system is otherwise called relay equipment, because it operates entirely upon relay methods, and because the relay itself forms one of the principal pieces of apparatus in the whole. This statement, therefore, becomes perhaps unintentionally a direct attack upon that type of exchange equipment which has been adopted by the engineers of the largest experience. What are the facts? First of all, some of you may know that telephone relays, which, by the way, have recently been adopted for telegraph work in London by the postoffice, are of a very special type, but have only recently been developed, and you may take it as a general thing that they are safe to use. I have had the records for the last twelve months examined in respect of four central battery exchange equipments. In the four exchanges there was necessarily an increasing number of relays in use throughout the year. The average number in use throughout the year in the four was 6,700 cut-off relays, the type referred to in the paper as worked off the test circuit. During that time there was an aggregate of 178 faults on the 6,700 relays, equivalent to 0.026 faults per relay per year, or, if the rate be constant, one fault per relay in thirty-seven and a half years. Bringing the line relays into account, you have altogether 13,400 relays. The line relays do not give so many faults, or perhaps I should say they give fewer faults. You have the total for the 13,400 working out at 0.02 faults per relay per annum, equivalent to one fault per relay in fifty years.

Regarding the series jacks, I think the remarks in the paper have not been put forward seriously. I can conceive of no circumstances likely to arise which would warrant an engineer putting series jacks into a large equipment, say, for over a thousand lines. As regards small equipments, series jacks may quite properly be used, but this has been done in central battery equipments for some years. Can the author then have had any experience of the work done by modern exchange equipments? The ring-through system is stated in the paper as having been adopted in Sweden, Norway, the Continent, and South Africa, and the context would lead one to assume that it has been adopted in large towns. During last May and June I visited Stockholm for the purpose of studying something of the telephone system there. They have not got call-wire nor have they got ring-through. There are two systems in Stockholm—the Almänna Company and the Riks, the Government. The first has magneto call and clear, the signals being lamps operated by relay; the other has magneto call and clear, and there is a method of passing calls to a non-busy operator on the lines of the old Express system. I visited also Copenhagen, where the system is magneto call and clear, and Brussels, where it is central battery. Regarding some of the other large towns on the Continent, in St. Petersburg central battery is being fitted; in Moscow there is something like the Riks system in Stockholm, but with central battery either just done or being fitted; Paris, magneto call and clear; Vienna, the same, but with lamps as signals; Buda-Pesth, central battery; Lisbon, central battery; Berlin and Hamburg, magneto call and clear.

It is a well-known fact that the German Postoffice, the telephone authority for that Empire, has recently decided to install central battery in the future. There are also a number of other small towns that I won't bother you with where central battery is working or is being installed. As to South Africa, Cape Town and Johannesburg I am not sure, but I understand that they have the ring-through system, while in Durban they lately had the call-wire system, but are now having central battery fitted. If you accept Stockholm and those other places as evidence of what is being done, you cannot shut your eyes to other places. In December and January last I visited the United States and Canada for the purpose of studying the telephone work there. I inspected systems in New York, Boston, Montreal, Toronto, Buffalo, Chicago and Brooklyn. At all these I saw central battery apparatus working, except at Montreal and Toronto, at which two places the systems were in the course of changing, Toronto having nearly gone over to common battery. While over there I learned that in the Bell companies alone in the United States there were relay equipments at work or in construction to the extent of 647,000 direct lines. I do not want to get into an argument on Mr. Webb's figures. He mentioned 1,000,000 telephones, I refer to direct lines; the ultimate capacity of these equipments is 1,441,000 lines. There is a big capital invested in these exchange equipments, and they are not doing this lightly. In the United Kingdom for the company with which I am connetced there are, either in commission or on order, central battery equipments to the extent of 45,000 direct lines—equipped, not ultimate capacity—and the Postoffice has equipments to the extent of 31,000 direct lines. All this is interesting to a telephone engineer, but you can, if you want, get an idea of the relative positions of the equipments mentioned in the paper and those which I have referred to without being a telephone expert at all. There is an ordinary law in engineering as in Nature, that the rate at which an organization progresses is proportionate to its inefficiency, or, as Herbert Spencer puts it—"As fast as adaptation approaches completion, it becomes slower and slower"; and again—"The forces which produce change become less as the need for change diminishes." You can multiply examples for yourself, if you think it over. One I will give you. You don't have much need for change in clock faces, because they have become standardized; the forces which produce the change have diminished, therefore you find them steady. You may also take the example of the extra coal necessary to propel a train an extra mile an hour, or the B. H. curve, or the rate at which low organisms multiply. By comparing and valuing the rate of alteration at different periods, you can get some idea of the position of the art at various times. Take another case. You know that the efficiency of a dynamo has advanced to a very high art, because you now get ninety-five per cent efficiency, and you have not much further to go. When, therefore, you find, on the one hand, an extremely unstable state of affairs during the very short period described in the paper, indicated by the differences between system and system belonging to the Corporations, and even between exchange and exchange in Glasgow, and, on the other hand, you find that central battery equipments designed some four or five years ago are practically modern and very efficient to-day, can you arrive at any other conclusion than that these Corporation systems are behind the others? They are on a lower point on the curve.

Those Corporations which have embarked upon the telephone business did so at a date when much experimental and pioneer work, upon which vast sums have been expended, had been done. It was quite possible for them to enter into possession of knowledge and experience which had cost them nothing, but instead of this, we see them passing through the experiences which the telephone companies passed through years ago. I think the outcome is quite clear. Some day or other—possibly it is forecasted in the proposed abolition of the call-wire in Glasgow—reorganization that will involve much scrapping on a very extensive scale must take place, and the infraction of well-known cardinal principles will reap its due reward in the very serious wastage which those cities will have to face.

Mr. Eastman, the next speaker, said:

There are two schools of telephone engineers—in America and this country, monopoly and Independent. Ideas put forward by the monopoly engineers are dictated and limited by the monopoly companies, and the systems they advocate are the systems which manufacturing telephone companies allied to these companies are best able to produce. Independent telephone engineers occupy a free position, as practically the whole telephone market is open to them, and they are better able to consult the wishes of subscribers.

The call-wire system was introduced into Glasgow by the telephone committee, as it was at that time best known to subscribers, and had a considerable vogue in this country as short a time back as four or five years. In addition to this, the switchboard in connection with the call-wire system is of such simple and at the same time excellent construction as to lend itself to alteration, or to the introduction of other systems. At the time at which a decision was come to by the telephone committee as to the system to be installed in Glasgow, I consider that there was no proved modern system which could with satisfaction have been introduced.

To mention the word relay to a switchroom inspector five years ago was very much like holding a red rag before an infuriated bull. Many of the relays in use by the telephone company at that time were always giving more or less trouble, though this was very carefully hidden from the outside public. Being an old National man, I think I am speaking with some authority. The trouble was due to the relay either failing to respond, or failing to make proper contact in the local circuit, which meant that no signal was received by the operator. Even to-day a great deal of trouble is experienced with relays, though they have been considerably improved, and the perfect relay has yet to be introduced. In most of the modern systems one or more relays are necessary in connection with each line.

From an engineering point of view, I do not for a moment defend the call wire, but at the same time I certainly consider that Mr. Webb is wrong when he contends that no supervision of the service is possible. In the call-wire distributing board at present used by the department a supervisor can tap every operator's position and ascertain what is going on, and a shorthand clerk also does a certain amount of tapping on these positions, keeping full details of the conversations taking place between operator and subscribers. Again, should an operator become too busy, it is possible to take a portion—say, a third—of her subscribers from her, and transfer them to an operator who is less busy. I cannot agree with Mr. Webb that the operator should do all the operating, as it appears to me that the system instead of being improved will be retarded. From my own point of view, I always feel more satisfied in calling up subscribers myself, as I feel certain that some effort at least is being made to obtain an answer, whereas if the ringing is left to the operator the subscriber, if he receives no reply, is dubious as to whether the subscriber wanted has been rung up or not. An altercation may then ensue between the subscriber and the operator, in which case precious time is being lost which could be devoted to answering other subscribers. Of course, when I say that the operator is ringing up the subscriber wanted, I do not necessarily mean that she has to press her ringing key the whole of the time, as the ringing may be automatic till the called subscriber takes his telephone off the hook.

You will notice that neither of the gentlemen advocating the common battery system has made the slightest reference to the quality of speech with this system. My experience with the common battery system is that when the line is speaking well it speaks very well indeed, but the speech is extremely variable, depending to a large extent on the number of subscribers connected and the condition in which some of those subscribers' lines may be.

Among the general public, especially in Glasgow, during the last year or two, there has been too much of the parrot-like call of lamps, lamps, as if lamps were the only forms of signaling which were any good. The only advantage in installing lamps is that they take up less space on the switchboard. In actual operation they save no more time than a well-constructed, mechanically replaced indicator (which combines the local jack), which has the advantage of making a certain amount of noise when falling, and so attracting the operator's attention should her eyes not be immediately fixed on the signaling apparatus. Although in recent years lamps for switchboard purposes have been greatly improved, they still give a great deal of trouble by burning out at an inopportune moment. An indicator, on the other hand, if well constructed, very seldom gets out of adjustment, and takes far less current to work it than does the lamp. The cost of local current is one of the chief points against installing a lamp system.

There are, it is true, many advantages for automatic calling and clearing, though at times both subscribers may accidentally replace their telephones and so clear the line.

No perfect system of telephones has yet been introduced, each existing system having its advantages and disadvantages. The advantage of the call-wire is quickness in getting the operator, and the subscriber can always know where he is. The disadvantages are that one fault may perhaps affect as many as twenty subscribers though these can be readily transferred to a break-down board, and the call-wire also leaves the means of signaling at the mercy of irresponsible persons, who may consider it a joke to hamper operating work as much as possible.

The common battery system has many advantages, but also disadvantages, including variable speaking. The fact of the subscriber's line breaking down in insulation to the slightest extent means that his line for a time at least will be inoperative.

I quite admit that a more perfect system than the call-wire system is required, and can be obtained, but at the same time no "perfect" system will be obtained until we have perfect apparatus, perfect operators, and perfect subscribers.

Mr. Bennett her took the floor and spoke as follows:

Mr. Chairman and gentlemen, when I consented, on the pressing invitation of our indefatigable secretary, Mr. Tidd, to read a short paper as a stop-gap for a blank evening entirely to oblige him, I had no idea the occasion would be seized to organize such an attack on free telephony. My poor fragment of a paper, dictated to a shorthand writer almost at the last moment, did not seem to contain anything of a volcanic description, but was a mere narrative of fact, making no reference to the National Telephone Company nor to any of its works. Yet, what a commotion has been raised. London has vomited forth its members, primed with such exalted eloquence, that the poor Glasgow section has only contrived to get a word in edgeways. I don't know whether Glasgow takes this invasion from the metropolis as a compliment, but I really think it constitutes a testimony to the strong position to which municipal telephony has attained. If the Corporation telephone systems referred to in my paper were as defective as alleged, there would be no occasion to take such trouble to expose their faults. In such a case they might safely be left to find their proper level at the bottom of the Dead Sea. When, as is the case, the Corporation telephone systems continue to prosper and to find favor, then we can understand why the equanimity of the monopolists totters, and there is an irresistible impulse towards personalities.

Mr. Webb says that the central battery system has been a very great improvement in New York, and from this I deduce that the system which it replaced must have been an atrociously bad one, for he says that the average time taken to get a connection was forty-five seconds, and that the central battery system has reduced that to 23.7 seconds. The reduction certainly means a great improvement; but the service remains slower than the Glasgow Corporation's, and slower than that of any Corporation. Since the statement was made I have looked over the Glasgow records from 1902 downwards, and I find that it is very unusual for twenty-three seconds to elapse from the time of asking a connection to hearing the voice of the subscriber called; so that an average such as they are content with in New York would not be considered good work in Glasgow. Although I would be the first to admit that the call-wire has drawbacks, yet I repeat what I said before, that when properly worked the call-wire system is beyond all comparison quicker than the central battery system. Some of you have probably had experience of the Postoffice Exchange in London. There the system is such as Mr. Webb recommends, so it *must* be as near perfection as anything can be in this world. I have taken great pains to test it. We find that the service, even when the connections asked for are confined to subscribers linked with the central exchange, so as to exclude branch switchrooms, is at least twice slower than in Glasgow.

In the important matter of speaking, I am quite sure that the central battery cannot compare with the Glasgow, or with the Portsmouth, or Swansea, or Brighton Corporation systems. In connection with the central battery system there is a point about which subscribers complain very much. When the operator makes your connection you hear a tremendous crack in the telephone. I am so accustomed to telephones that it does not disturb me much, but there are subscribers who assert that it affects them very much indeed, subscribers who say that it actually hurts them. About secrecy, you don't get any secrecy with the central battery system. An operator, by a small motion of her finger, can put herself in connection with the line and hear all one has to say, and, if she is careful, you need not know that she is there. I think that is a drawback, and it is a drawback which we have endeavored in all earnestness to avoid, or at least minimize, in Corporation exchanges. It is true, as one of the speakers remarked, that you cannot dodge the operators altogether, for if you use a parallel multiple switchboard an operator may plug in on a distant multiple, and so tap; but we can avoid, and we do avoid, listening by the home operator, who is the most likely offender. In residential suburbs that is of great importance, because ladies frequently have confidential chats with each other, and privacy is very much appreciated. In that direction the central battery system is a most dismal failure. In Portsmouth, Swansea, and Brighton I have adopted the central battery for signaling, but I have not ventured to use it for speaking yet, and I must see very much better results from the existing American systems before I go that length. The central battery system has certainly the great advantage of automatic signaling; that is to say, it leaves few opportunities for mistakes or omissions on the part of the subscriber. I admit that. The American system has other faults. With it you cannot use the transmitter and receiver combined in a hand-set attached to the instrument by a flexible cord, such as Corporation competition has procured for you in Glasgow, but must adhere to the fixed transmitter and the separate hand telephone or receiver, which has to be hung on a hook by the side of the instrument. Fancy Glasgow going back to that! But the Postoffice, under Mr. Kingsbury's guidance, use these old-fashioned and clumsy devices in London, and they are, too, of unusually ugly and inartistic design. In Hull the National Telephone Company tried hand combinations in connection with their American central battery system there, but when the service is complained of they excuse it by saying it is the flexible cord of the hand combination which is at fault! Another serious drawback of the American system is the great difficulty experienced with it in connection with extension lines. Very many subscribers go in for extension instruments in their offices or other buildings, and the popularity of this convenience is always increasing. With the Brighton and other Corporation systems there is no difficulty in meeting the demand fully and effectively, but the vaunted American central battery system entirely breaks down, and another system has to be adopted for extension lines. The automatic signaling, which is untruthfully held up as its special and exclusive recommendation, fails in respect to extensions. Mr. Webb's remarks as to the inconvenience of the system of numbering Corporation subscribers have no foundation in fact. He says that in New York the numbers are arranged so as to avoid the use of more than four digits. So are ours. The x, y, z, etc., of which he complains are prefixes which replace names. In New York each exchange has a name prefixed to a number, like "Courtland 9642." In Glasgow the "Courtland" is replaced by a letter, and that is all. No number in Glasgow, apart from party lines, has more than one letter and four digits, so that our method is actually shorter, and saves time, breath, and printing.

The Brighton system has these advantages at least—it is far less complex than the American plan, it gives no rude shocks to the subscriber, and it enables the subscriber to call the exchange by taking off the telephone and to get clear by putting the telephone on. I do not think that the Glasgow subscribers, after the long experience

they have had of the ring-through system, would tolerate its abolition. On the central battery system, the operator, just before she connects, gives a short ring to the called subscriber, and then puts you through. If the called subscriber hears the bell and answers quickly, that is all right, but if he does not hear the bell or does not answer quickly then you are left standing at your instrument, and, not getting any answer, do not understand what the position is; and it is perfectly obvious that you have to ring-off and get the operator again and say, "I cannot get so and so. Will you give him another ring?" which she has to do. If the subscriber does not then reply you have to do this a third time, and so on. With the Glasgow system, if the subscriber you call up does not answer to the first ring you ring on and on until you get him, and that is practically a very considerable advantage. The Brighton system does that too, and this in addition—it notifies the operator that a connection which has been made is effective, and she can put it out of her mind until the ring-off comes. If the called subscriber does not reply the operator knows (without tapping), and if she is smart, and has time, she can take steps to discover the reason and find a remedy. The throwing of the second drop by the called subscriber's answer has not the evil effect imagined by Mr. Webb, as no ring-off is recognized unless the calling subscriber's drop falls too. In my paper I stated that a profit of about £1,000 was expected in Portsmouth on the first year's working. The balance sheet has since been laid before the telephone committee, and shows a net profit of £1,250 upon the first year's working, after paying interest and sinking fund, besides which a sum of £60 is carried to reserve to meet possible bad debts, so that there is really a net balance of £1,310 on a capital expenditure of £29,100. This works out at considerably less than £20 per instrument, so that the net profit is equal to more than four per cent on the capital invested. My friends, Messrs. Kingsbury and Webb, gave evidence at the Portsmouth local government board inquiry when the Corporation wanted the loan, and if you refer to the blue-book of the inquiry you will find these statements in Mr. Kingsbury's evidence, page 16—"*Q.* In your view, will this business be a financial success?—*A.* No; I do not see how it can. *Q.* Do you think it commercially sound?—*A.* I think it quite uncommercial." Then in Mr. Webb's evidence you will find, on page 14—"*Q.* Are the (proposed) rates remunerative?—*A.* I do not think that they can possibly be remunerative"; and on page 15—"*Q.* Will the undertaking be a charge on the rates?—*A.* I think it will be a charge on the rates." Yet these gentlemen go about the country posing as experts! Notwithstanding these very gloomy predictions, Portsmouth comes out with a very handsome profit indeed on the first year's working, with a surplus such as they did not get on their electric lighting scheme until it had been working for several years. The call-wire system may be a subject for discussion, but I think you will all admit that it has done something for Glasgow. At the Telephone Inquiry in 1897 it was given in evidence that a telephone could not be obtained in Glasgow under £10 per annum, and that only within half a mile of the exchange, while in Govan and other outlying places as much as £25 per annum had to be paid. Well, at the present day the National Telephone Company are advertising, "The payment of a penny per day enables any one to be connected with the National Telephone service." That means that a telephone can be laid for about 25s a year. And this advertisement is not restricted to any district or distance; that is to say, it applies equally to Govan as to Glasgow; so that the call-wire system, with all its alleged defects, has had the effect of bringing the cost of the telephone in Glasgow down from £25 per annum to 25s! I think that is a fact which meets a great many criticisms. It speaks for itself.

In the United States the American Bell interest is no longer the predominant one. Hundreds of Independent telephone companies have sprung into existence within the last six or seven years, which companies have now got a much greater number of telephones working than the American Bell has, and are always gaining ground. None of them uses the central battery system,* so that it cannot be the standard even in America, since it is not employed by the companies which possess the largest share of the work.

I am sorry to find that Mr. Gill, an engineer-in-chief of such an important company as the National, has no larger conception of his duties and opportunities than to become an abject copier of foreigners. It has ever been a maxim with his company that the Americans, having had larger and greater experience in telephony than we have, must necessarily know more than we do, and be the safest guides to follow. His company has paid dearly for that faith in the past, and is apparently, from what he says, about to repeat the experience in the future. It is a faith that has killed invention and initiative amongst the National staff, and debilitated their understandings; and it is most disappointing to find that Mr. Gill is content to act simply as registrar of American pretensions, and not to design, to develop, to improve, and to lead on his own account. For my part, I have never yielded to the absurd theory that America leads the world in telephone construction, and that anything they do, propose, or supply must necessarily be the best. I have always considered such dependence on foreigners to be absolutely degrading to British engineers, and I have not only designed my own apparatus, but I have succeeded in getting it, for the most part, manufactured in our own country. It can be understood, therefore, that I do not stand high in the estimation of Mr. Kingsbury or his American backers, and that they find it difficult to accept me seriously as a telephone engineer. I have already enumerated the very many faults of that system which Mr. Gill tells us clearly has practically reached finality. On the other hand, I believe that as soon as the Americans have induced the Postoffice and the National Telephone Company, as well as many of the Continental telephone administrations as may be, to put it in everywhere, they will come forward with some new development or variation which they will declare to be such a great improvement that any engineer disregarding it will have to be considered behind the age and not up to the standard. Then the poor fellows will scrap all their central battery equipments, and send millions of pounds' worth of new orders to Chicago. This process has already been gone through three or four times, and Mr. Gill's finality will last until the time appears ripe for repeating it, and no longer.

If the National Telephone Company would publish statistics like the Corporations do, and not shroud their doings in Tibetan darkness, we might acquire some knowledge of these and similar matters. But the company has pursued a policy of concealment for many years past. No one of their employes may publish a book, or write an article, or contribute a paper, on pain of dismissal, and I have no doubt that Mr. Watt and Mr. Cook, as well as Mr. Gill, had to secure special dispensation from their chief before venturing to take part in this discussion. While that policy prevails, it is not surprising that outsiders are ignorant of what goes on, and that the company's staff is unequal to the task of designing apparatus. But it is unfortunate for Great Britain all the same, for it destroys all initiative, and reduces our engineers to the grade of mere copyists. Subsequently to the discussion it occurred to me that a practical way of replying to Mr. Cook's wholesale condemnation of the Brighton Corporation system would be to make the subscribers themselves referees, especially as Messrs. Gill and Cook, as the chief electricians to the National Telephone Co., are no doubt responsible for the design and installation of the National Telephone Co.'s new switchboard at Brighton, as well as for the drastic reconstruction of their system there, which has taken place since the Corporation started. I therefore caused reply-postcards to be issued to all subscribers on the Corporation system who have also National instruments. The cards were worded as follows:

"Corporation Telephone Department,
"82 Grand Parade,
"Brighton, May 20th, 1904.

"Statements having been made that the Brighton Corporation telephones are inferior and inefficient, I should be much obliged if you would be so good as to write your candid opinion, based on your experience, on the annexed reply-card, and return it signed to this address. A similar card is being addressed to every Corporation subscriber who has, or has recently had, both telephones."

REPLY.

"My candid opinion, based on actual experience, is that, of the two telephone systems now existing in Brighton, the more efficient and trustworthy is that of the *——."

"*Here write 'Corporation' or 'National.'"

The following is an analysis of the 447 cards which were returned:

In favor of the Corporation	398
In favor of the National	5
No difference in efficiency	12
Satisfied with Corporation, but expressed no opinion about National	28
Uncertain	4
Total	447

Eighty-four of the 398 emphasized their verdict in favor of the Corporation service by adding eulogistic remarks, such as "By far," "Most decidedly," "They cannot be compared," "Corporation the only efficient and trustworthy one," "Most emphatically," "Without hesitation," "By a very long way," "Unquestionably," "Without a doubt," "Absolutely the very best," etc.

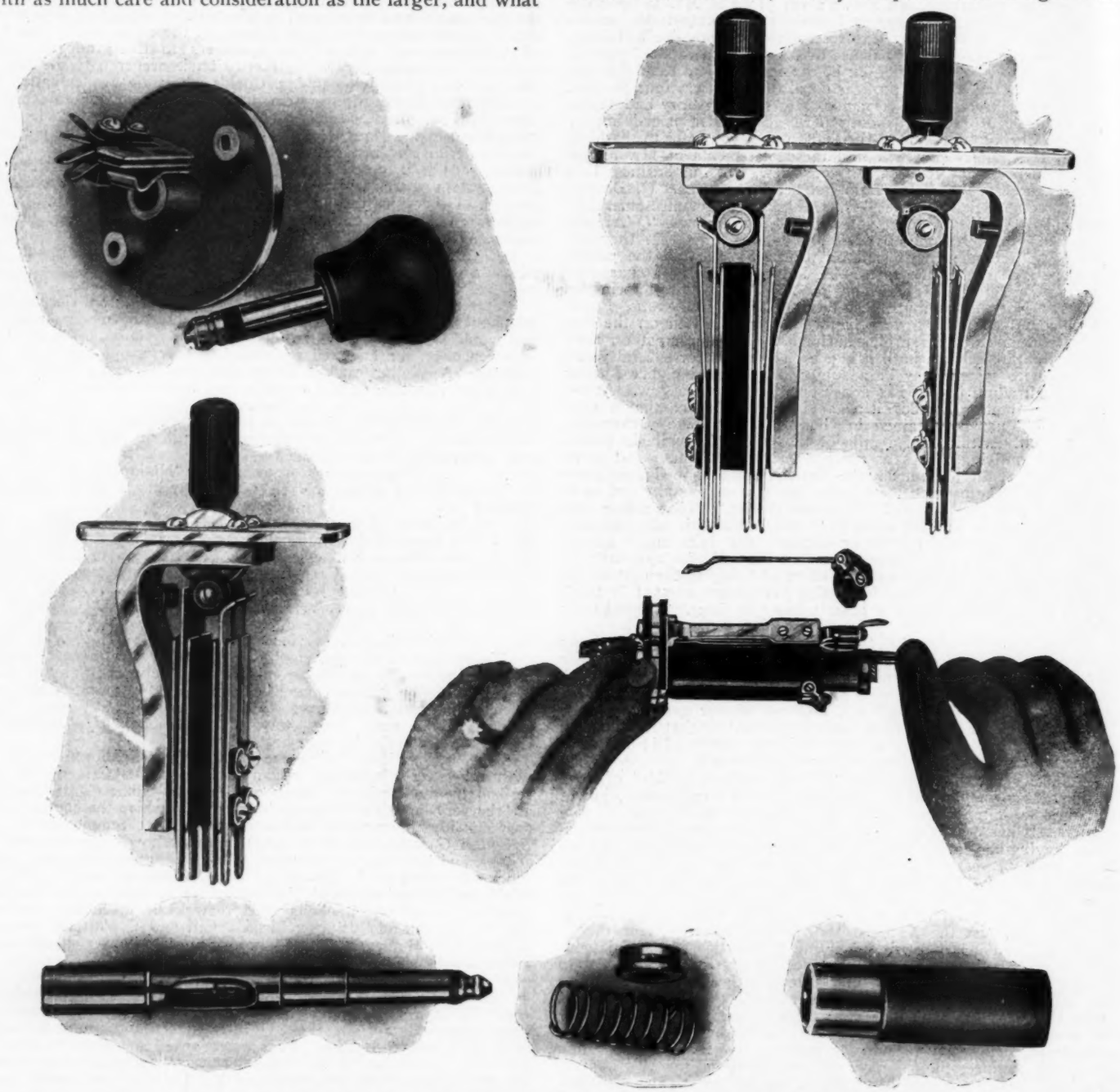
Now, the National Telephone Company's switchboard is worked with relays and lamps, as recommended by Mr. Gill, and is described by the National Telephone Company's officials in Brighton as "the very latest development in telephony, which the company has spared neither money nor brains to install" (see Supplement to the *Brighton Gazette*, 28th May, 1904), and yet how ridiculous does it appear, and how puerile the strictures on my paper, under the magic touch of experience! Messrs. Gill and Cook, as well as Messrs. Webb and Kingsbury, wish the Institution to believe that the Corporation system which elicits such remarks is inefficient, obsolete, and behind the age. Surely Messrs. Gill and Cook will now call to mind the old adage: "Those who live in glass houses should never throw stones."

[Note.—In Mr. Bennett's reply to the discussion on his original paper he makes the statement that none of the Independent telephone companies in the United States uses the common battery—or central energy—system. This assertion is far from the facts in the case. Hundreds of the Independent companies in this country use the common battery system, and Mr. Bennett's statement, therefore, must be made from pure ignorance of American telephone conditions.—ED.]

CHICAGO BELL TYPE EXPRESS SWITCHBOARDS

Many epoch-making inventions recently have been made which tend towards rapidity of operation and repair in switchboard equipment. Switchboard engineering is a science of infinite detail; and that board is best in which the most minute features of mechanical construction are treated with as much care and consideration as the larger, and what may be termed more visible, parts. The above statements are made upon the authority of the Chicago Telephone Supply Company of Elkhart, Indiana.

The accompanying illustrations and descriptions also have been furnished us. The drop is simple, compact and durable. The drop coil is removable in ten seconds without the use of tools. The armature is not held in place by pivot screws and lock nuts, but by tempered steel flanges with

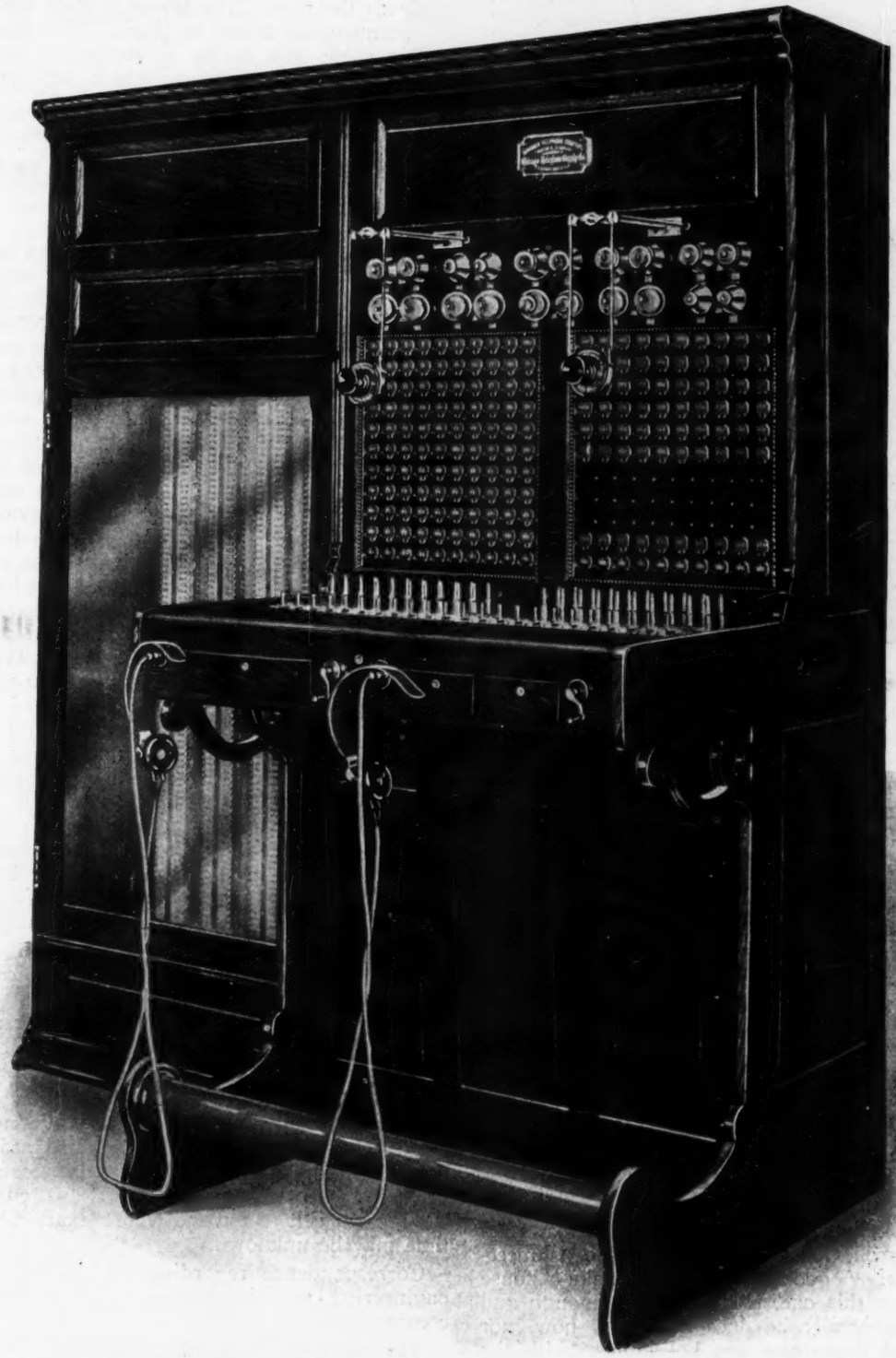


CHICAGO TELEPHONE SUPPLY COMPANY'S BELL TYPE EXPRESS SWITCHBOARD PARTS.

appropriate holes to engage projections on the saddle. A careless workman cannot injure this part.

The night bell circuit does not pass through the hinges and is insulated from every other part. If two or more drops should become grounded on their cores, no crossing of lines could become possible, because the night bell circuit is insulated from every other part.

as the owners of the patent cannot revoke the license nor interfere in any way with users of Chicago switchboards. As to the ultimate outcome of the Fisk patent no one can sav; at the present time it is upheld by the United States courts and its validity must be recognized, even though accompanied by a hope that it will eventually be thrown out of court.



CHICAGO TELEPHONE SUPPLY COMPANY'S BELL TYPE EXPRESS SWITCHBOARD AND DISTRIBUTING FRAME.

Users of Chicago apparatus are protected absolutely from all dangers from suits for infringement by a perpetual and non-revokable license issued by the owners of the Fisk patent, covering all forms and kinds of self-restoring drops. Even though a difference should arise between the owners of the patent and the Chicago Telephone Supply Company, no danger would be incurred by customers of the latter,

In the meantime all users of switchboards are in danger of suits for infringements unless protected by a perpetual and non-revokable license such as that which protects all users of Chicago switchboards.

The key, operator's key, transmitter arm, distributing board cabinet and several front and rear views of different styles of arrangement are shown herewith.

NEW COMPANY IN THE FIELD.

The Runzel-Lenz Electric Manufacturing Company has recently been organized under the laws of the state of Illinois for the purpose of manufacturing telephone and switchboard cords and switchboard cables. The plant is located at 97-101 South Clinton street, Chicago, and is equipped with the most modern and expensive machinery obtainable for the manufacture of cords and cables, all of which is installed in a commodious factory, where every effort is centered toward the turning out of goods that are altogether excellent and dependable. It is the purpose of this company to manufacture not only the highest class of goods that modern machinery and skilled workmanship can produce, but to make the prices so attractive that a large share of trade shall

W. L. RUNZEL.

J. M. LENZ.

accrue to them. This company is now in a position to supply the trade in general with cords of any description used in connection with telephone and switchboard work.

The personnel of the company consists of W. L. Runzel and J. M. Lenz, formerly connected with the Stromberg-Carlson Telephone Manufacturing Company. Mr. Runzel has been actively engaged in the electrical field for a period of sixteen years and his experience in the cord and cable branches has covered a very wide range. For the past two years he has been superintendent of the Stromberg-Carlson Telephone Manufacturing Company's cable plant at Rochester, New York. Mr. Lenz has been identified with the leading Independent telephone manufacturers for a period of eight years.

This new firm starts out with the most flattering prospects of immediate success, and at the rate orders are already pouring in the capacity of the plant will be taxed to its limit almost from the first.

CABLE POLE HOUSE.

The new cable pole house No. 1, designed and manufactured by the F. Bissell Company, Toledo, Ohio, is meeting with a large sale. A good carpenter can make a house perhaps as perfect as this one, if he is smart enough and has the tools, but generally he does not know how, nor what is needed, and in no case can he compete with the manufacturers with modern machinery.

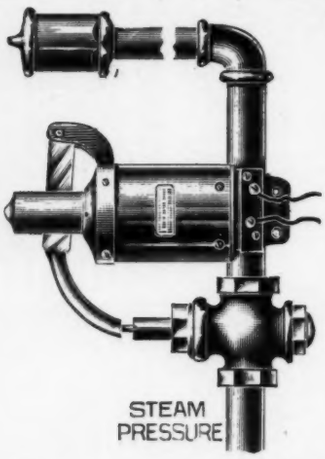
These pole houses are made in cabinet style and equal quality cannot be produced by hand at prices quoted. The Bissell Company has sold pole houses for seven years, reducing the price as trade increased, and its houses have given universal satisfaction. These houses are dry. There are two compartments, both provided with doors, all doors closing against shoulders, and no communication is possible with the outside, except through the bottom, where the cable and spider wires enter, and where joints can be and usually are made water tight.

They are suspended from iron straps which encircle them and are held by screws run into solid wood and in no case entering the inside space. At the bottom is an adjustable shoe through which the cable passes. The shoe is lagged firmly to the pole. The house is then set perpendicularly and permanently bolted in place. Five sizes are made.

This cable pole house is shown in the new specialty catalogue of the company, which will be sent upon request.

ELECTRICALLY OPERATED STEAM OR AIR WHISTLE.

The problem of successfully operating a large steam or air whistle for signal or other purposes by electricity has been solved and successfully developed by the Electrical Appliance Company of Cincinnati. The accompanying illustration is the standard type for all ordinary pressure of steam, and any voltage of either alternating or direct electric light or battery current may be provided for in the winding of the actuating solenoid.



This device operates any whistle up to three inches in diameter at 150 pounds pressure, and when provided with a large valve will operate a six-inch whistle at the same pressure. It will be understood from this data that the device is of substantial construction and it is perfectly reliable under exacting conditions. It may be placed either indoors or out and at any required distance from the operating key. The arc that is usually formed when the electric current in a solenoid is broken has been entirely eliminated, so that a key having a 1-16 inch break is sufficient. This permits of short or long blasts of the whistle being given in rapid succession. No intermediate relays are required.

Another important feature of this device is the fact that it may be operated by alternating current. This is accomplished through the aid of the Churcher alternating rectifier. This device converts any alternating current into direct current of any required voltage and has a wide field of application.

The electrically operated whistle is a necessity in many large plants, such as steel mills, ship yards, lumber yards, foundries, etc. It is also a most satisfactory adjunct to a private branch telephone exchange, as it enables the operator to signal a call to anyone whose exact whereabouts at the time may be unknown.

Correspondence regarding this device is solicited from engineering and factory equipment companies, telephone companies, etc.

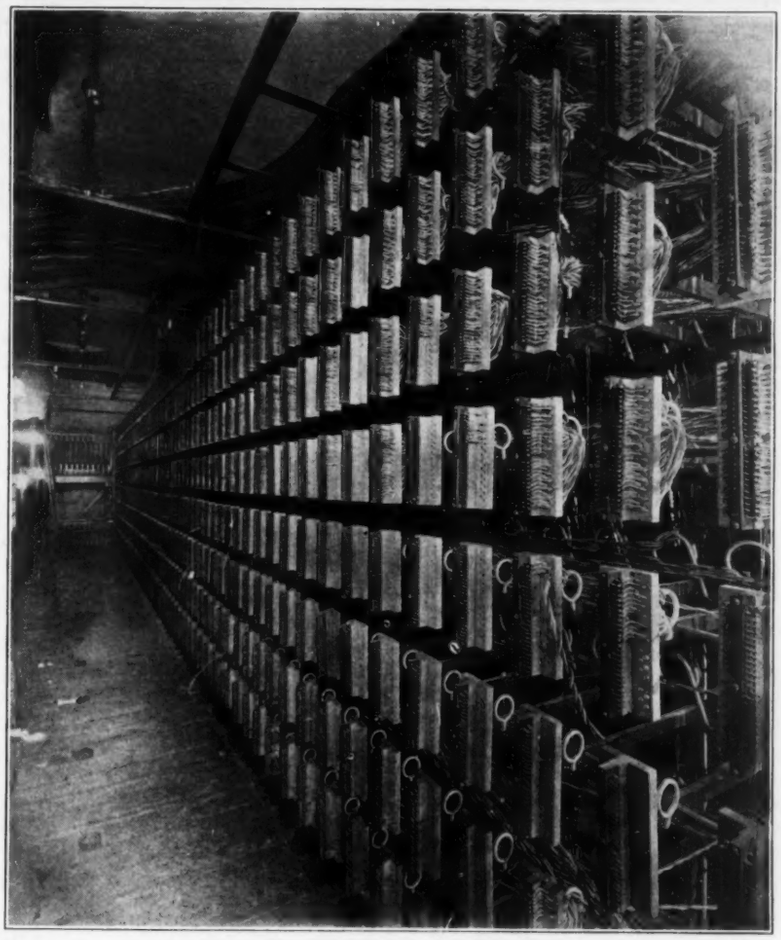
The Electrical Appliance Company is placing a number of these whistles at Cincinnati and has also received an order for several to go to San Francisco.

By placing telephones in their homes Missouri farmers have provided their property with something they did not expect—fire protection. Now when a farmer's barn or house catches fire, if he has a telephone, he secures the aid of his neighbors in fighting the blaze without delay.

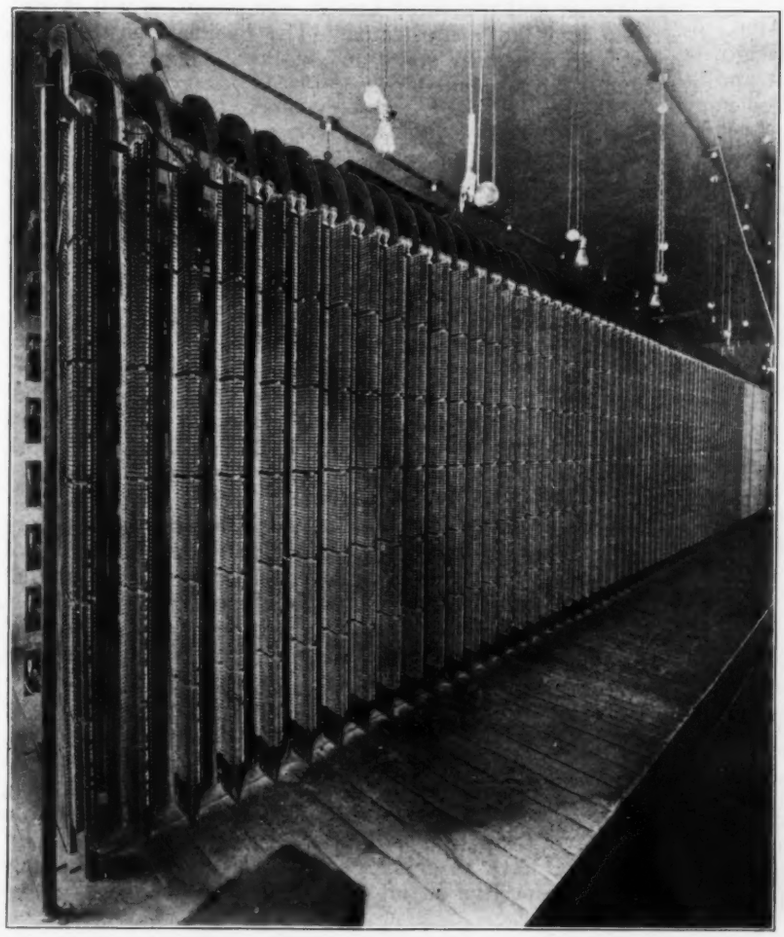
A MODERN PROTECTOR AND DISTRIBUTING BOARD.

One of the largest single protector and distributing boards ever installed is that furnished by Frank B. Cook, Chicago, to the Illinois Telephone and Telegraph Company, for their main exchange in Chicago. This enormous distributing board has a switchboard capacity of 10,100 pairs, and a line capacity of 12,500 pairs. The framework of the board is constructed of the usual angle irons and channel irons, and is capable of extension at any time by simply bolting new sections of the frame to that already installed. Wherever the circuit conductors (the jumper wires) would lie against an iron portion of the frame, an enameled ring is provided, through which the conductors extend and are thereby kept out of close proximity with the ironwork of the frame.

The switchboard side of the frame is equipped with Cook's No. 44 protectors, which are mounted in banks of twenty-five pairs each, on vertical steel bars three-eighths by four inches. Each vertical contains six of these twenty-five pair banks, or 150 pairs. The springs of each pair of the protective apparatus are arranged and adapted to receive a testing plug which permits all of the different circuits through the apparatus, including the switchboard circuit, the line circuit through the heat coils, the line circuit direct, or either heat coil separately, to be tested independently of each other and without the necessity of removing the heat coils or lightning arresters from the apparatus, with but one insertion of the plug.



Instead of wiring the alarm circuit for all of the pairs of protectors to a common alarm bell or indicator, each side of each vertical of the protective apparatus is wired to a lamp signal which is mounted directly on top of the vertical, always in plain view. When a heat coil operates, it closes the alarm circuit of one side of the vertical in which it is situated, and thereby causes the corresponding lamp to light and give a signal that a protective device has operated. The signal lamp stays lighted until the protective apparatus is restored to its normal position. In addition to a signal lamp for each side of each vertical strip of protectors, there is a large gong or signaling device wired common to all the signal lamps, to give a general signal when a protector or any part of the board operates. This general signal calls the attendant's attention to the fact that a protective device has operated, in case he is not at a place from which the signal lamp can be seen. With this arrangement of the protective apparatus and signal lamps, the matter of locating trouble is a very simple one.



The distributing terminals for the line side of the distributing frame are mounted in hard rubber strips on maple blocks, there being twenty-five pairs of terminals on each block and eight blocks mounted one above the other, to form a vertical of 200 pairs of terminals.

The frame is much more compact than similar frames heretofore made, and the cabling shows the results of neat and skilled workmanship, the whole representing a very neat appearance and giving the observer a picture of the complete and modern construction and workmanship of an up-to-date telephone exchange.

This distributing frame was manufactured and also installed by Frank B. Cook, the installation being a point worthy of note, as it is not customary for manufacturers of this class of apparatus to superintend the installation of same.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, Chicago, has removed its offices from 183 Lake street to 184 Lake street.

THE F. BISSELL COMPANY, Toledo, reports unusually large sales of its Marline cable hangers, and finds it difficult to keep up with the demand.

THE W. G. NAGEL ELECTRIC COMPANY, Toledo, Ohio, is distributing its new 904-page catalogue, which is one of the most complete that it has ever issued.

THE GEMMILL TELEPHONE AND MANUFACTURING COMPANY, Cleveland, is placing on the market a new telephone ringer, for the adjustment of which no tools are necessary.

THE SOUTHERN EXCHANGE COMPANY, New York City, which was organized several months ago by E. G. Chamberlain, formerly of the Standard Pole and Tie Company, reports a very satisfactory business.

THE GERMICIDE TELEPHONE ATTACHMENT COMPANY, Arlington, California, which recently entered the manufacturing field, is doing a large business in the manufacture of antiseptic telephone mouthpieces.

WILLIAM ROCHE, formerly of 42 Vesey street, New York, has moved to 52-54 Park Place, where he occupies one entire floor in the manufacture of the "New Standard" dry cell and other electrical appliances.

THE MCROY CLAY WORKS, Brazil, Indiana, and Chicago, has issued its August calendar-blotter, which is as neat and attractive as any of the previous half dozen it has issued in 1904. These blotters are an ornament to any desk.

THE RITTENHOUSE-MILLER COMPANY, Philadelphia, has moved to Trenton, New Jersey, where it will occupy its new building, trebling its former floor space and putting it in position to meet the increasing demand for its goods.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY, Chicago, is sending out a neat mailing card, calling attention to its telephones for private systems—from office to residence, office to warehouse, etc. Attractive prices are quoted.

THE STANDARD TELEPHONE AND ELECTRIC COMPANY, Milwaukee, since it has become established in its new offices and factory in the Cream City, is flooded with orders, and is working overtime in order to take care of the influx of new business.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY, Chicago, has had to supply an increased demand for general construction material, and for the last few months has enjoyed a very heavy run on its "Mesco" dry batteries for telephone use.

THE TETER-HEANY DEVELOPING COMPANY, York, Pennsylvania, has opened business for the manufacture of wire covered with its new fireproof insulation. This company is having considerable success in the manufacture of this fireproof insulation, and its product has met with approval. It will be necessary to largely increase the size of the present plant to handle the new business which has been secured.

THE OHIO VALLEY GLASS TELEPHONE COMPANY, Chicago, has closed its factory until August 15, and if hot weather continues will not open up full force until September 1. At present the company is fifteen carloads behind on stock orders.

THE TRITT ELECTRICAL MANUFACTURING COMPANY has been organized at South Bend, Indiana, with a capital stock of $15,000. The incorporators are B. E. Tritt, A. H. Calvert, Charles H. Kreighbaum. The object of the company is to manufacture electrical specialties.

THE VESUVIUS BATTERY COMPANY, New York city, is now striving to equip and organize its factory sufficiently to fill all orders, many of which it is at present unable to fill promptly. This speaks well for the merits of the Vesuvius cell which this company manufactures.

THE CRAWFORDSVILLE WIRE NAIL COMPANY, Crawfordsville, Indiana, and Chicago, reports extraordinary sales of galvanized wire for telephone purposes. The factory is running overtime to keep up with orders on hand and the flood of new business which is constantly coming in.

THE AMERICAN CONSTRUCTION COMPANY, Williamsport, Pennsylvania, and Washington, D. C., expects to erect a large plant at Williamsport for the manufacture of a special vitrified block to be made from a shale found in that vicinity. The company will require a large machine shop, foundry and other buildings.

THE BAIRD MANUFACTURING COMPANY, Chicago, has recently gotten out a new 32-page catalogue on telephone, pay-station and measured service equipment, which is well written and finely illustrated. The business of the company is in a healthy state, and in fact, orders are pouring in at an unprecedented rate.

THE F. BISSELL COMPANY, Toledo, Ohio, with its sixty-one varieties of high grade weatherproof wire, goes the celebrated "Heinz 57 varieties" four better. A leaflet just issued by this company states that it has nearly a quarter of a million of pounds of this wire in stock for immediate shipment and invites correspondence.

THE STANLEY ELECTRIC MANUFACTURING COMPANY, Pittsfield, Massachusetts, has published a large wall map of the "S. K. C." system of long-distance transmission in California, which is a most valuable and interesting contribution to contemporary engineering data. The work was produced by the office of R. D. Lillibridge, New York city.

THE OSBURN FLEXIBLE CONDUIT COMPANY, New York City, is sending out a folder in which the requirements of good wiring are enumerated. The company claims that its "Flexduct" solves the question of good interior wiring. This product, it is stated, has been approved by all official boards of inspection in the United States. Catalogue and prices upon application.

THE VOUGHT-BERGER COMPANY, LaCrosse, Wisconsin, recently issued a neat mailing card relative to the merits of the "Pendent" telephone which it manufactures, and offering to send one of these telephones to any person on thirty days' trial. This confidence which the Vought-Berger people have in their goods cannot fail to favorably impress prospective buyers and no doubt account in a meas-

ure for the splendid trade in "Pendents" which the company is enjoying.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, manufacturers of the popular anchor of that name, is introducing a novel device in the shape of an anchor eye, which it calls the "Roller" anchor eye. Their use is recommended highly by all linemen, who recognize their worth and saving power. The Miller Anchor Company invites correspondence in regard to them.

THE S. H. COUCH COMPANY, Boston, has recently closed several large orders for its No. 30 transmitter. The company takes a just pride in the success of this transmitter, considering that from the first one put out to the present time there has never been a change made in its construction. This transmitter is shown in price list B, which will be gladly mailed to anyone upon request.

THE CROUSE-HINDS COMPANY, Syracuse, New York, manufacturer of the "Norbitt" temporary socket, was in evidence at the Elks' convention, held in Cincinnati last month. There it used nearly 30,000 "Norbitt" porcelain temporary sockets for decorative purposes, and over 500 "Norbitt" temporary sockets were also used in making the huge American flag which hung over Government Square.

THE BROWNLEE LUMBER COMPANY, Chattanooga, Tennessee, in order to facilitate the handling of its eastern business, has erected a factory for the manufacture of cross arms at Chattanooga, Tennessee, and on account of the central location has decided to remove its office to that point. The company will continue to operate its factory at Meridian, Mississippi, also its warehouse at Cairo, Illinois.

THE SAFETY INSULATED WIRE AND CABLE COMPANY, New York city, is out with a beautifully illustrated catalogue, describing its "Safety" seamless rubber insulation and "Safety" wire for telephone construction and other purposes. The catalogue is a gem of the printer's art, being embellished with handsome half-tone cuts and typographically a fine piece of work. The company will send catalogue upon request.

MATHIAS KLEIN & SONS, Chicago, wish to draw the attention of the telephone trade to the fact that all their tools are stamped "M. Klein and Sons." This is necessary, since they have recently had returned to them two pairs of defective climbers which were merely stamped "Klein." Tools so marked are not of their manufacture, so that buyers of tools supposed to be made by this firm should be sure that the stamp is in full.

THE LINDSLEY BROTHERS COMPANY, Spokane, Washington, dealers in western cedar poles, is enjoying the largest trade in its history, and has recently sold numerous large orders to patrons in the Independent telephone field. Their large winter's cut of poles is now seasoned and ready for shipment on short notice. The demand is principally for short poles, of which they have a large quantity, but their stock of long poles is equally complete.

THE CONNECTICUT TELEPHONE AND ELECTRIC COMPANY, Meriden, Connecticut, has placed upon the market a low-priced battery telephone, which is known as the "Duplex." These instruments are sold at the very low price of $5 per pair, and fill a long felt want for a low-priced, high-grade battery telephone, for use in connecting houses, offices, etc. This instrument is as simple to install as a common electric bell and is equipped with a loud talking long-distance transmitter. The company reports the sale on this instrument as being extremely large and has issued bulletins describing same, which will be sent on request.

THE HOLTZER-CABOT ELECTRIC COMPANY, Boston (Brookline), Massachusetts, has issued Bulletin No. 302, displacing No. 139, relating to dynamotors and motor-generators which it manufactures. It is elegantly illustrated and abounds in interesting descriptive matter. This bulletin and any other of the numerous bulletins which have been issued by this company will be sent upon request, also information and prices bearing upon the goods manufactured by this well known firm.

THE TELEPHONE APPLIANCE COMPANY, New York city, has placed on the market a new style of telephone directory that is unique. It consists of a cylinder that can be readily attached to any desk or wall set, in which is a ribbon mounted on a spring roller. Upon this ribbon are printed the names of parties who are often called. To find the number of a party the ribbon is pulled out till the desired information appears, and when through using, it returns automatically within the case.

THE AMERICAN BATTERY COMPANY, Chicago, is furnishing all the storage batteries used in installations of the Automatic Electric Company. Among the systems using this type of battery is the Hopkinsville (Ky.) Automatic Exchange, which was recently installed. This company has an exhibit at the Louisiana Purchase Exposition in connection with the Automatic Electric Company. An invitation is extended to all who visit the fair to call and inspect the different types of cells on view.

THE MONARCH TELEPHONE MANUFACTURING COMPANY, Chicago, reports the largest month's business in July ever handled by this company, the orders taxing the capacity of the factory to its limit, but by working an extra force of men and keeping the plant running night and day, all customers were given satisfactory deliveries. The Monarch Company recently shipped several carloads of telephone supplies out west. Its western business is very encouraging and business in general is the best in its history.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, has issued a folder which draws the attention of the trade to the high grade of apparatus it manufactures. The policy of the company is outlined, which shows that the desire on the part of the manufacturers is to attain perfection in all the details of the business, and accounts in a large measure for the success attained by this company in the telephone manufacturing field.

THE W. G. NAGEL ELECTRIC COMPANY, Toledo, reports an ever increasing demand for its "Ready" payout reels. These reels, on account of their construction, readily appeal to the practical construction man. The parts being interchangeable makes this an easy reel to repair should it become broken, and the reel with tension attachment is especially desirable to regulate the paying out of telephone wire. Descriptive matter relative to the "Ready" reels will be gladly forwarded by writing to the above company.

THE NATIONAL WIRE CORPORATION, New Haven, Connecticut, has moved its general and executive offices to 114 Liberty street, New York city. In announcing this fact in a circular the corporation says: "We shall continue, as we have done in the past, to give all inquiries, orders and correspondence of every nature, prompt personal attention, and with our enlarged facilities and close attention in the manu-

facture of all standard and special wires, wire rope and other wire specialties required by the trade, we hope and believe we shall merit your continued patronage."

THE HALL L. BROOKS COMPANY, Tomahawk, Wisconsin, dealer in white cedar poles and posts, evidently believes in doing things by rule, at least we should judge so from the sample bookkeeper's rule which we have received from this company, and which it is sending out to its numerous customers and friends. The rule is a beauty and is really the finest thing of the sort we have ever seen used for advertising purposes. Anyone receiving one of these rules should consider himself fortunate, as advertising souvenirs of this sort don't grow on every bush.

THE NATIONAL CONDUIT AND CABLE COMPANY, New York city, manufacturer of bare copper wire, weatherproof wires and cables, lead-covered wires and cables, for telephone, telegraph, light and power work, has issued its "Copper Gossip" for August. This gives a number of points on the general business outlook, the copper market situation, New York and London copper markets, exports and imports of copper, 1904, copper mining news and developments, and European copper statistics. It should be in the hands of every telephone manufacturer and exchange manager.

THE COLUMBIAN ELECTRICAL COMPANY, St. Joseph, Mo., will soon move into the handsome new four-story brick and stone building, which is being erected for it in that city. Owing to its rapidly increasing business the company found it necessary to secure much larger quarters. In its new home the Columbian company will have facilities for handling a much larger business than in the past. The building is constructed in the most substantial manner, is ornate in appearance and is equipped with all modern conveniences. In the Columbian company's advertisement on another page may be seen a cut of the new structure.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, New York, has just issued a bulletin, the title of which is "Generator-call Telephones." Among the more important things described in the bulletin is the company's No. 4 type of transmitter, which will be its standard in the future. A party-line selective intercommunicating system is also described. Telephone parts are very fully set forth, as are also divided-circuit telephones, the "sure-ring" bridging telephones, portable combination telephones and adjustaphones. The bulletin, beside being carefully prepared and nicely illustrated, is a credit to the company's "department of publicity."

FRANK B. COOK, 242 West Lake street, Chicago, has been kept busy trying to supply the demand for his type S. S. pole cable terminal, which has jumped into immediate favor. Among others the Bureau County Telephone Company, with their main office at Princeton, Illinois, has installed these terminals in six of its exchanges, located at Princeton, Sheffield, Spring Valley, Tiskilwa, La Moille and Walnut. Mr. Cook also reports the recent shipment of more than 200 pole cable terminals to the Pittsburg and Allegheny Telephone Company. One hundred more are nearly completed for shipment. The Pittsburg and Allegheny Company is using some of these terminals for their McKeesport exchange, the balance being for some of their other exchanges.

BRUNO GROSCHE & COMPANY, New York city, are sending out to the trade an interesting circular bearing upon the merits of the well known S. P. F. Carbolineum (wood preserving oil), which they manufacture and for which they have a large demand. S. P. C. Carbolineum protects telephone poles and all wood against rot and decay and against the ravages of ants, teredo, borers, woodpeckers, etc. The circular contains cuts of wood treated and untreated with this preparation, which speak volumes in its favor. There are also numerous flattering testimonials from companies and individuals who have used S. P. F. Carbolineum for years and who attest to its wonderful preserving qualities under all conditions. Full information and prices upon application.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, has completed delivery of the new exchange equipment for the Portage Telephone Company, Portage, Wisconsin. It consists of the company's latest type lampline central-energy switchboard arranged for an ultimate capacity of 1,200 lines and equipped for the immediate operation of 500 lines, together with complete power-plant equipment, consisting of storage batteries, charging machines, power board, battery cabinet, etc. The Portage exchange has also placed an order for 400 central-energy telephones, and after the work of installation is completed will have a thoroughly up-to-date exchange. It has entirely rebuilt the outside construction, placing all of the wires in the business portion of the city underground.

THE CROCKER-WHEELER COMPANY, Ampere, New Jersey, by arrangement with the celebrated electrical engineers, Brown, Boveri & Cie of Baden, Switzerland, has secured their alternating current designs, patents and rights of manufacture in America, and has retained them as consulting engineers. This concern is now putting on the market alternating current generators, transformers and accessories of the most perfect design and construction, adapted to American practice. Opportunities to bid on this apparatus are invited. The company has already closed a contract for a 200 K. W. 60-cycle, 440-volt, alternating current generator for the Atlanta plant of the Procter & Gamble Company, Cincinnati, and is figuring on an actively increasing number of alternating propositions.

THE CENTRAL ELECTRIC COMPANY, Chicago, sent out last month to all of the telehone trade, a neat little booklet cataloging its line of telephone and telegraph specialties. This booklet was accompanied by an attractive monthly calendar appropriate for July, the two together making a useful remembrance. The Central Company is authority for the statement that its August calendar will be even more attractive than that for July and those companies not receiving a copy should write for one. This company is now sending out to its trade a circular calling attention to the fact that it is sales agent for the Waterbery lead encased paper telephone cables, and is authority for the statement that it is in a position to quote exceedingly attractive figures and can make it worth while for prospective buyers to write for prices. The high grade quality of Waterbery cable is well known to the telephone trade in general.

FRANK B. COOK'S new manager, Frank W. Pardee, is not overlooking any chances to secure publicity for his firm or to advertise the goods manufactured at the Cook plant. Some of the means employed by Pardee to arouse the interest of prospective customers are unique, to say the least, and bound to win trade. Just now there is being sent out from the Cook offices a novel advertising conceit in the way of a circular, calling attention to Cook's well-known protective apparatus. The circular is made up of a dozen or more fac simile clippings from papers in different parts of the country chronicling fatalities from shocks by electricity at telephones, through the medium of lightning, live wires, crossed wires, etc. It then goes on to state that "every one of these accidents could have been prevented by the use

of Cook's protective apparatus." The circular is one that is bound to catch the eye, as it very much resembles a page from one of the Hearst papers, and shows that Pardee is as original in designing advertising matter as he is indefatigable in hustling business for his firm.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, is now placing on the market for use in connection with its well known switchboards, as well as adaptable to any other make of switchboard, a four-party selective key, which contains many admirable features. They have obviated the usual difficulty of constructing this type of key on a rubber base, which in service has a tendency to warp. Their key is constructed on a solid metal frame, and is certainly a very attractive type of key for companies employing the four-party work in their exchanges. They will be pleased to send printed matter and quote prices on this equipment, complete or in part, for the installation in their own apparatus or that of their competitors. At their sales department in the Monadnock building, Chicago, the Eureka company is displaying a high-grade line of telephone apparatus, including their new automatic exchange equipment, containing essential and special points of merit. The company is now distributing its new No. 31 bulletin, and will be pleased to forward same to any company interested.

THE CENTRAL TELEPHONE AND ELECTRIC COMPANY, St. Louis, has purchased the buildings formerly occupied by the Missouri Medical College. The buildings have a frontage of 83 feet on Lucas avenue, and a depth of 145 feet on Twenty-second street. The lot is located in the factory district, and on account of the substantial character of the buildings is considered a very desirable property. The company will use the buildings for a factory and store room. It is having the entire building remodelled with new elevators and Granitoid cellars. All new machinery, such as punch presses, band saws, milling machines, screw cutting lathes, etc., will be installed. The buildings are especially desirable on account of their solidity and also because light is available on all sides, besides a big skylight. The company has brought a man from Berlin at great expense to make all the special tools needed in the manufacture of its apparatus. The company has been so crowded with work that it became imperative to move into larger quarters to handle the constantly increasing volume of business that is coming in.

THE SWEDISH-AMERICAN TELEPHONE COMPANY, Chicago, has recently shipped to the following named telephone companies complete office equipment and telephones: Lane Telephone Company, Crane, Missouri; Kress and White Telephone Company, Riley, Kansas; Denver Co-Operative Telephone Company, Denver, Indiana; Farmers' Telephone Company, Coulee City, Washington; Gasconade Central Telephone Company, Hermann, Missouri; Franzen and Miller Telephone Company, Golden, Illinois; St. Clair County Telephone Company, Lowry City, Missouri; Kinderhook Telephone Company, Kinderhook, Illinois; Sewal Switchboard Company, Sewal, Iowa; Assumption Telephone Company, Assumption, Illinois; Somers Township Telephone Company, Leverett, Illinois; Medora Telephone Company, Medora, Illinois; Hesston Rural Telephone Company, Hesston, Kansas; Farmers' Mutual Telephone Company, Brownstown, Illinois; Marion Telephone Company, Marion Junction, South Dakota; Leigh Independent Telephone Company, Leigh, Nebraska; Citizens' Mutual Telephone Company, Joice, Iowa.

THE STERLING ELECTRIC COMPANY, Lafayette, Indiana, furnished the telephones and switchboard for the Hamilton County Telephone Company's new exchange at Webster City, Iowa, the installation of which was made under able supervision of C. R. Brown of the Sterling company, taking nearly four weeks' time. The apparatus is up-to-date in every particular and the exchange is pronounced by all who have seen it to be one of the best equipped in Iowa. It is expected that it will be in full operation by August 1. The Sterling Company reports extraordinary activity in the sales department. Orders have recently been received for new switchboards and additions to the present equipment for Eaton, Ohio, (a 500-line tubular drop board); Monticello, Ind.; Brandenburg, Ky.; Mattoon, Ill., and Galena, Kan. Recent large shipments of telephones have been made to Hudson, N. Y.; West Liberty, Iowa; Ridley, Ind.; Ossian, Ind., and four-party selective type telephones to Cedar Rapids, Iowa. This company has just finished sending out a complete folder describing its various protective apparatus, which will be sent to any one for the asking.

KELLOGG COMPANY GETS SETBACK.

The sale of a majority of the stock in the Kellogg Switchboard and Supply Company to Western Electric and Bell interests in 1902 is generally known, but it may not have been as generally noted that the policy of the company in regard to patents and litigation underwent a change during the period between that sale and its announcement eighteen months later. As a result of the change it became known that suits would be brought against the Independent companies, as one official of the company stated it, "right and left." The subsequent broadcast announcement of the sale somewhat spoiled the plan which had been developed, but it seems evident that the suits have only been postponed, not abandoned. As an evidence that the policy still remains the same, we have the recent suit against the Dean Electric Company, William W. Dean, and his associates. In April counsel for the Kellogg Company went before Judge Thompson of the United States District Court, in Cincinnati, and upon exhibition of its bill of complaint, accompanied by an affidavit of President DeWolf, succeeded without Dean being heard or notified, in obtaining a temporary restraining order addressed to the Dean Electric Company, William W. Dean, Samuel B. Rawson, T. M. Brush and A. E. Barker, restraining Mr. Dean from executing assignments to the other defendants named, and them from accepting such assignments. The order was made returnable before Judge Wing at Cleveland, and continued in force until July 6, when arguments were heard by Judge Wing on the Kellogg company's motion for an injunction to continue the restraint during the pendency of the suit.

Judge R. S. Taylor appeared for the Kellogg company, and Judge W. W. Boynton and Edward E. Clement for Mr. Dean. The most elaborate argument was made in support of the motion, Mr. Dean's recognized ability as an engineer and absolute preeminence as an inventor and designer of telephone apparatus being dwelt upon at length, as well as set forth in numerous affidavits by the Kellogg people. The most flattering testimonials to the quality of work expected from the Dean company were given with a frankness that is unusual, to say the least, among competitors. It was asked, not only that Mr. Dean be restrained from working for the Dean company, but that he be forced to go back to work for the Kellogg company under an old contract which they set up.

Judge Wing refused the injunction at once upon the conclusion of argument, without leaving the bench. In announcing his decision he reviewed the contract set up (which is similar to many contracts between manufacturing companies and their employes), and dwelt particularly upon the provision requiring Mr. Dean to submit any inventions he might make to the Kellogg company, to be accepted or rejected as the company might decide. The court held that there was a complete absence of mutuality in the contract,

there being no means by which the employe could force the company to accept his inventions or continue to employ him, in spite of the fact that the aid of the court was invoked against him and was intended so to be. It was also mentioned that, of course, no court of equity would enforce specific performance of a contract for personal service, and it appeared that there were other grounds for denying the motion, but it was not necessary to advert to these, the lack of mutuality controlling and going to the very root of the matter.

It is difficult to perceive what ground there is for further action in this case, and we consider that the Independent interests are to be congratulated upon this early and positive check to a mischievous attack.

NEW TELEPHONE APPLIANCE.

The Telephone Appliance Company, Metropolitan Life Building, New York city, has placed upon the market one of the most unique telephone appliances we have yet seen and one that is finding great favor with the telephone using public, the sales on the novel appliance already being far beyond

SHOWING THE TELEPHONE APPLIANCE IN USE.

the expectations of the company, as a result of which it is taxed to its utmost to fill orders.

The accompanying illustration shows the telephone appliance in use. It can be applied to any wall or desk telephone and is so simple that a child can operate and understand it. It is made of solid brass, highly nickel-plated to match the telephone, and for office and home use it fills a long felt want. It does away with the writing of names and numbers on the wall, on woodwork, or on pieces of paper and tacking up on the wall, or in books, and misplacing and not being able to find when wanted. Names and numbers can be written on the ribbon with lead pencil, pen or by typewriter and arranged alphabetically and found instantly. The ribbon can be taken out for listing of names and call numbers. The ribbon is large enough to contain 150 names on each side and when the ribbon is pulled out of the appliance, it rolls back automatically.

For office use where it is necessary to be in constant communication with customers, the appliance is indispensable. For home use, for listing such names and numbers as the grocer, butcher, doctor, druggist and friends, it is just the thing. The always-ready telephone call device is ready for use on the instant and is the most compact, unique and practical article of its sort ever invented; it is like the telephone, of which it is part—a necessity which now makes the use of the telephone instantaneous—and it does away with the wear and tear on a busy man's brain. All who have seen this new and novel invention are loud in its praise and say that it fills a want never filled before.

Prices and full information regarding this appliance will be furnished upon request.

CONNECTOR FOR DRY BATTERIES.

In considering the question of dry batteries, at first glance it would seem difficult to imagine a more simple or convenient method of connecting the wires to them than by the usual screw and nut so universally found on this type of cell. The Fahnestock Transmitter Company of 132 Havemeyer street, Brooklyn, N. Y., claim, however, to have made an improvement, and the accompanying cut shows a dry battery equipped with the new spring binding post that this company is placing upon the market.

In this connector the wire is gripped by the action of a spring and it is claimed that all possibility of a loose contact at the battery is eliminated, and as well that the wire can be put in or taken out in one-tenth of the time that it takes to adjust a screw post. The connector will grip any size wire up to No. 12 B. & S., and in making the connection no screw driver or pliers are needed.

The company recommends this connector on dry batteries for use on automobiles, as they claim that no amount of vibration or jar will affect the contact. We learn that leading battery manufacturers are becoming interested in this connection and that many of them are already supplying batteries so fitted.

The annual meeting of the managers of a number of Independent telephone companies was held at Pittsburg, Kansas, recently. There was a good attendance and the extension of their lines was discussed at length, and it was decided to take in more territory during the next year. The Independent telephone companies are working together harmoniously, and many improvements in the way of convenience will be made during the coming year. The managers present were: George W. Crawford, Girard; M. L. Robeson, Galena; Dudley Ellis, Vinita, I. T.; E. W. Dow, Cherokee; George Spangler, Chetopa; Mr. Matthewson, Cherryvale; Fred Brown, Parsons, and Mr. York, Coffeyville.

As marvelous as has been the growth of the Independent movement in the past seven years, even greater will be its development in the next decade.

F. M. Proctor is installing an exchange at Alvord, Texas.

A. O. Wells will establish a telephone exchange at Brewster, Minnesota.

D. L. Thompson is preparing to rebuild the telephone lines in Kirklin, Indiana.

D. L. Thompson is preparing to rebuild the telephone lines in Kirklin, Indiana.

John Stroman has been granted a telephone franchise at Grey Eagle, Minnesota.

Louis Brietenbach has applied for a telephone franchise at Sonoma, California.

Dr. Bortz contemplates extending his telephone line from Niota to Dallas City, Illinois.

William McIntyre will construct a telephone line leading out from Granite, Montana.

Frank Temple has taken charge of the telephone system at Parkston, South Dakota.

H. W. Bishop has secured a franchise to construct a telephone system at Eustis, Florida.

F. W. Heidel has been appointed manager of the Central New York Telephone Company.

Z. R. Young has sold the Mount Calm (Texas) telephone exchange to E. T. Nickels.

Frank Crowly is constructing an Independent telephone line from Bly to Bakerfield, Missouri.

Wallace Wilson has been appointed manager of the Fremont (Neb.) Telephone Company.

Allen Cox has purchased the Chamberlain telephone line from Stratford, Iowa, to Linnburg.

A. H. Foster has resigned as superintendent of the Rochester (Minn.) Telephone Company.

C. W. Macomber is reported to have bought the local telephone system at Prentice, Wisconsin.

Z. R. Young has purchased the telephone exchange at Mount Calm, Texas, of E. T. Nickels.

J. R. Power has been appointed assistant manager of the Maysville, Kentucky, telephone exchange.

C. J. Peterson of Iola, Kansas, has been promoting a farmer telephone company at Elsmore, Kansas.

W. H. Settle has begun the construction of an Independent telephone system at Madisonville, Kentucky.

O. N. Campbell, A. L. Phelps and H. Sanders have organized a telephone company at Hatton, Washington.

H. B. Brookings has been appointed manager of the Star Telephone Company at New Market, Minnesota.

J. H. Riviere & Co. will construct a telephone system at Greenville, Alabama, work to begin at an early date.

Paul Boone of Stillwater, Oklahoma, has been appointed manager of the Pawnee telephone exchange, same state.

E. F. Elliott and other residents of Rumford, Maine, have petitioned the selectment for a telephone franchise.

G. G. Candee, formerly of Drayton, North Dakota, has purchased the telephone exchange at Leeds, North Dakota.

G. F. Stearns has been appointed manager of the Enterprise Telephone Company of New Hardwick, Minnesota.

F. A. Ansberry has purchased the telephone exchange at Mason City, Iowa, formerly owned by Greenlee & Ansberry.

A. A. Garris has resigned as manager of the Iron Range Telephone Company's exchange at Bemidji, Minnesota.

E. L. Palmer and J. Kyle have built a telephone line at Rogers Prairie, Texas, to connect with the system in Bryan.

Manager Fant of the telephone exchange at Thief River Falls, Minnesota, is preparing to install a new switchboard.

J. B. Driggs has purchased the stock of the Ohio Valley Telephone Company, with headquarters at Bellaire, Ohio.

G. M. Hackett and W. M. Young of Maine are planning the construction of a new telephone system at Presque, Iowa.

O. H. Freeman and others have incorporated the Cushing (Iowa) Independent Telephone Company, capitalized at $50,000.

Frank L. Bills of Sioux City, Iowa, the widely known Independent telephone promoter, was recently in Chicago several days on business. Mr. Bills reports the Independent outlook as being excellent.

E. B. Hayward and others are soliciting subscribers to an Independent telephone system at Newport, New Hampshire.

Manager J. W. Scott of the Commercial Telephone Company of Warsaw, Indiana, will greatly enlarge his plant's capacity.

A. B. Ammerman has taken charge of the telephone system at Lawson, Missouri, and will improve and extend the service.

J. B. Cowing and G. G. S. Campbell have been granted a franchise for a telephone system at Alexandria, Minnesota.

Warner Goodykoontz, who operates the Atlanta (Ind.) telephone plant, proposes to extend the Atlanta line to Tipton, Indiana.

Roy Bell of Watseka, Illinois, has accepted a position with the Fisk-Newhall Telephone Manufacturing Company of Chicago.

Manager Jack Montgomery of the Rennsselaer (Ind.) Telephone Company will make a number of extensions and improvements.

R. E. Johnson has bought the local telephone exchange at Barnum, Minnesota, and will make many improvements immediately.

A. B. Kerlin has been awarded the contract for constructing a telephone line from Devil's Lake to Fort Totten, North Dakota.

J. J. Lane has been appointed manager of the telephone exchange at Colfax, Washington, to succeed E. C. Drews, who has resigned.

William Goltra has been appointed assistant manager of the Home Telephone Company's exchange at Crawfordsville, Indiana.

W. C. Stickney of Moulton, Iowa, has sold his telephone lines to Clyde Mann of Woodbury county, and the transfer has taken place.

G. S. Schroeder of Fountain City, Iowa, has purchased the Pope County (Ill.) Telephone Company's exchange at Golconda, Illinois.

K. G. Chrysler and J. H. Lemuel have been awarded the contract for the construction of a rural telephone system at Lake Park, Iowa.

Frank Mortimer and others have petitioned the Tacoma (Wash.) city council for a franchise for the installation of a telephone system .

Henry A. Halverstadt is promoting the organization of a telephone company to establish an Independent exchange at Leetonia, Ohio.

E. C. Warner has been appointed superintendent of the Kentucky division of the Gainesboro Telephone Company, at Glasgow, Kentucky.

J. H. Cradelbaugh of the Merlin (Oregon) Townsite Company states that the company will build a telephone line from Merlin to Glace.

O. G. Potter of Pepin, Wisconsin, has purchased the Pierce county telephone lines operating in the eastern portion of Pierce county.

N. D. De Varney of Kansas City has secured a franchise from the city council for the construction of a telephone system at Albany, Oregon.

H. C. Jones, manager of the Piqua (Ohio) Telephone Company, was married to Miss Lillie Van Daver of Lexington, Kentucky, recently.

Frank Mortimer and others have petitioned the city council for a franchise for the installation of a telephone system in Tacoma, Washington.

George W. Fish and others are endeavoring to secure a franchise for the Automatic Telephone Company of Chicago in Swansea, Massachusetts.

E. T. Talkington, Abe Shaw and W. L. Talkington are the promoters of a new telephone line from Harrington, Washington, to Moscow, Idaho.

J. S. Benton has resigned as manager of the Salix Telephone Company of Somerset county, Pennsylvania, and has been succeeded by L. D. Shaffer.

C. C. Allen & Company contemplate constructing a telephone line from Ada to Nadler, Minnesota, and to extend same through Lockhart and Betcher.

Henry A. Halverstadt contemplates the formation of a telephone company at Leetonia, Ohio, to construct and operate an Independent telephone system.

T. K. Peterson and others have organized a telephone company at Badger, Iowa, with $10,000 capital and will erect a city and rural system this summer.

Attorney W. H. Ryan of San Pedro, California, has filed an application with the city council for a franchise to install a telephone system in that place.

M. H. Simmons was chosen president of the Zenith Telephone Company, which was recently organized at Portland, Maine, with a capital of $1,000,000.

A. L. Waterbury, who was at one time first vice-president and general manager of the Citizens' Telephone Company of Houston, Texas, has accepted a position as general manager of the department of the American Conduit Company. Mr. Waterbury will have his

headquarters at the Chicago office of this company, 1005-6 Manhattan building.

H. T. Baugher of Farmersville, Missouri, and G. L. Hill of Chulas, Missouri, have purchased the plant of the Palmyra (Mo.) Telephone Company.

Charles Farrer has purchased the telephone exchange at Ferris, Texas. It is his intention to extend lines to Red Oak, Rockett, Lancaster and Palmer.

A. B. Smith, assistant manager of the Woodbine (Iowa) Telephone Company, has been elected associate member of the Institute of Electrical Engineers.

F. A. Wunder, representing the Keystone Telephone Company of Philadelphia, has applied to the commissioners of Lower Merrian township for a franchise.

W. R. Blodgett of Battle Creek, Michigan, has been appointed manager of the Eaton County Telephone Company, with headquarters at Charlotte, Michigan.

George N. Pierce, formerly representative of the Vought-Berger Company of La Crosse, Wisconsin, has been compelled through ill health to resign his position.

William Rummel and Robert Staummhofer of Beyersville, Texas, are interested in the promotion of a telephone line extending between Beyersville and Taylor, Texas

C. S. Sharer, district wire chief of the Keystone Telephone Company, Philadelphia, has been elected associate member of the Institute of Electrical Engineers.

Messrs. Miley and Stranathan have purchased the telephone system at Lore City, Ohio, and will at once complete the system in the village and surrounding country.

F. B. Elce, owner of the Independent telephone system at Mitchell, South Dakota, has sold the same to the Dakota Central Telephone Company for $20,000.

Levi Larrick and associates of Wilbur, Washington, have organized the Sans Poil (Idaho) Telephone Company and are rushing work on the construction of a line.

Duncan Cameron of Black Butte, Montana, has arranged for the construction of a new telephone line from Great Falls to Eden, Meisenbach, Black Butte and Evans.

W. A. Sumner of Fairfield, Nebraska, has been awarded the contract for erecting the Clay county lines from Fairfield to Spring Ranch and from Fairfield to Dewees.

Vic Stevens of the Standard Telephone Company of Dubuque, Iowa, has bought the lines, telephones and franchises of the Sumner Telephone Company of Sumner, Iowa.

J. F. Fairman, author of "Telephone Wiring," soon to be published, has accepted a position with Waterbury & Co., New York city, in their electrical sales department.

W. I. Hibbs, E. B. Long, F. A. Ellithorpe and G. B. Thompson, Pittston, Pennsylvania, capitalists, have been elected directors of the Kewanee (Ill.) Home Telephone Company.

C. D. Morey and Hugo Prill of St. Louis and G. E. Eis, Al Harding, Robert Rohl and others have secured a franchise to operate a telephone exchange in Centralia, Illinois.

Joseph H. Young of Norton, Kansas, manager of the Central States Telephone Company, recently visited in Kansas City, looking over the plant of the Home Telephone Company.

T. P. Jordan of Dallas, Texas, has invented a phantom circuit, which he has successfully used over the lines of the Grayson County Telephone Company between Sherman and Dennison.

John McClish has petitioned the board of supervisors of Sonoma county, California, for a twenty-five year franchise to construct, operate and maintain a telephone system in that county.

Richard Piper, president of the Rural Telephone Company of Addison, North Dakota, is making arrangements for the extension of the lines from Lynchburg to Addison and Davenport.

H. I. Crawford has been appointed manager of the Independent telephone exchange at Warsaw, Wisconsin, succeeding P. Hirsch, who has taken up other business for the same company.

Henry Wilson, A. M. Caldwell, Peter Richards, W. C. Bemis, Louis Freeman, Albert Clark and others have petitioned the selectmen at Spencer, Massachusetts, for a telephone franchise.

Messrs. Dixon and Jessen, owners of the telephone exchanges at Brook and Morocco, Indiana, have purchased the Independent telephone exchange at Kentland, Indiana, from W. K. McGray.

Fred Pieggenkuhle, residing near Hockeye, Iowa, has purchased the property of the Sumner (Iowa) Telephone Company for $7,100. A new line will be put in to West Gate, Maynard and Randalia.

Herbert H. Herndon, William Shangland and Edgar J. Rose have incorporated the reorganized Ashland Independent Telephone Company of Ashland, Wisconsin, with a capital stock of $50,000.

M. A. Snyder, secretary of the Kokomo Telephone and Electric Manufacturing Company of Kokomo, Indiana, and J. W. Golding, manager of the Sims (Ind.) plant, were in Converse, Indiana, recently with a view to establishing an Independent telephone company, giving through service to Sims, Greentown, Amboy and Plevna.

C. H. Gale, owner of the West Plains (Mo.) Telephone Company, and W. N. Hicks, owner of the Willow Springs (Mo.) Telephone Company, are constructing a line connecting the two points.

V. L. Early and George W. Cooper, principal stockholders of the S. Morrison Telephone Company of Greenfield, Indiana, and county, contemplate extensive and valuable improvements for their system.

W. S. Edwards, who for the past three years has been manager of the Union Telephone Company's exchange at Keokuk, Iowa, has resigned his position and moved with his family to Fairfield, Iowa.

W. S. Paca, president of the Petroleum Telephone Company of Oil City, Pennsylvania, states that the company will make extension of the lines from Hydetown to Titusville, Townville and Guy's Mills.

W. D. Crist, formerly manager of the Fremont (Neb.) Independent Telephone Company's plant, will superintend the construction of the new telephone company's lines and plant at Grand Island.

Mart Getchell of the Williamsburg (Kan.) telephone exchange reports that the farmer lines' business is very heavy this spring and that the company expects to extend several new lines during the summer.

W. Lee Travers of St. Louis, J. P. Phelan of Wellston, Missouri, J. D. Houseman and C. R. Black are the incorporators of the Suburban Telephone Company of St. Louis, with a capital of $100,000.

E. N. Reaser has been granted a franchise by the city council of Lawrence, Kansas, to establish a local telephone plant. Mr. Reaser contemplates building an exchange that will cost in the neighborhood of $125,000.

Dr. O. A. Armstrong, Frank Baird, L. M. Vickers, Alfred Woods, the Rev. S. L. Crosson and John Hayter of Neola, Texas, will construct a telephone line from Neola to Greenville and install a local switchboard.

A. L. Waterbury and Charles Webster, Minnesota capitalists, have deposited with the city treasurer of Dallas, Texas, $5,000 as an earnest of good faith in their application for an Independent telephone franchise.

E. H. Martin of Webster City, Iowa, who owns more miles of telephone lines in Iowa than any other man, states that slot machines are bound to be adopted throughout the state as the solution of the "deadhead" problem.

J. F. Coad of Leonardtown, Maryland, and J. Canter of the South Maryland Telephone Company have announced that the line from Mechanicsville to Leonardstown will be continued to Laurel Grove and Morganza.

Manager Theodore Thorward of the South Bend (Ind.) Home Telephone Company furnishes his patrons with a bulletin service by telephone, the weather and the baseball results being the two topics in most general demand.

Charles A. Wright & Company of Hancock, Michigan, are organizing a company in Houghton county, which will establish exchanges under the patents of the Automatic Telephone Company in the towns of the county.

S. P. Grace, chief engineer of the Central District and Printing Company, Pittsburg, has had conferred upon him by the State University of Michigan the honorary degree of master of engineering, an honor worthily bestowed.

H. S. Dodge, representing the Manitowoc Telephone and Telegraph Company, has applied to the city council of Manitowoc, Wisconsin, for a franchise to construct and operate an Independent telephone system in that city.

John A. Driscoll of Rochester, New York, chief manager of the Wayne-Monroe Telephone Company, has been granted a franchise by the city council of Red Creek, New York, to construct and operate an Independent exchange.

Managers Stacey of the Twin City Telephone Company of St. Joseph, Michigan, and Badour of the Michigan State Telephone Company have been in consultation over the advisability of uniting the two exchanges at St. Joseph.

J. F. Strong, manager of the local telelphone exchange at Norwalk, Connecticut, has resigned to take a vacation and is succeeded by Maurice H. Nutting, who has been connected with the company for some time past at New Haven, Connecticut.

W. W. Harbaugh of Sullivan, Indiana, and W. T. Mallott have purchased the interests of John S. Bays, G. J. Sherman and G. R. Dutton in the Sullivan Telephone Company and will take charge of the business. Mr. Harbaugh will be the manager.

Philip Fitzsimmons of Cincinnati has filed an action in the Superior court of Ohio against David Hauss and the Fitzsimmons Telephone Manufacturing Company in which he seeks to regain control of 182 shares of stock of the corporation. Fitzsimmons is president

of the company and Hauss secretary. Fitzsimmons demands that control of stock be reinvested in him and Hauss be enjoined from disposing of stock.

Henry W. Bishop is actively pushing the matter of having a telephone service in Lake county, Florida, and is said to have backing fully to realize his plans. The city council of Eustis has granted him a twenty year concession, with liberal privileges.

W. H. Crumb has recently spent much time at Hot Springs, Arkansas, where he installed the new Independent telephone exchange. Under Mr. Crumb's able direction the system now has nearly 1,000 subscribers, while the Bell has dropped from 800 to less than 400.

Manager J. A. Driscoll of Rochester, New York, announces that the new Wayne-Monroe Telephone Company will furnish connections for all of the Independent companies of Wayne and Monroe counties. Many of the latter companies will enlarge as a result.

A. G. Davison, W. J. Jones, Newton Harris and J. M. Ellis have been appointed a committee to look after the purchase of supplies and the location of the lines and exchange which will be built at Centerville, Iowa, by the Farmers' Mutual Telephone Company.

J. M. Touchstone of Ida, Texas, is interested in the promotion of a telephone line connecting Ida with Sherman. It is also stated that a general rural system is contemplated among the farmers and truck growers over the county, to connect with Denison and Sherman.

Commissioner John H. Jackson of Jackson county, Indiana, states he will use his influence with the board of commissioners to induce them to build a free system of main telephone lines in that county as a means of encouraging the country youth to stay on the farm.

J. E. Adamson has disposed of the telephone plant at Broken Bow, Nebraska, to Wisconsin capitalists for $25,000. Lee Norton, with the J. I. Case Company of Racine, is said to be his backer. Abe Norton, a brother, will probably have the management of the business.

Senator Flinn and associates, who own the Pittsburg and Allegheny Telephone Company, are asking for franchises for a subway similar to that built in Chicago by the Illinois Tunnel Company. If successful in Pittsburg, they propose to also apply for a franchise in Philadelphia.

J. H. Morehead has been appointed manager of the Falls City (Neb.) Telephone Company. The company is making many improvements. It is building from Falls City southeast to connect with the Hiawatha's lines and thereby connect with St. Joseph and Kansas City.

W. T. Mills, architect, has awarded the general contract for the construction of the Citizens' Telephone Company's building, Columbus, Ohio, to R. A. Edgar, and the foundation work to H. Jones. It is expected to have this building completed December 1, ready for the equipment.

Col. A. L. Tetu, general manager of the Home Telephone Company of Louisville, Kentucky, recently spent several days in Chicago on business. He reports the Home company as enjoying a large measure of prosperity and the Independent movement in Kentucky as rapidly gaining ground.

Hon. Alden E. True of the Paxico (Kan.) Telephone Company states that his company has decided to build a line to Alma, Kansas, and establish a station with free messenger service, on account of the Wabaunsee County Telephone Company having severed connection with them at Paxico.

George Mimms, Frank Camp and W. M. Hirshfield of Trenton, Kentucky, have been in conference with the officers of the Home Telephone Company at Clarksville, Tennessee, for the purpose of securing a telephone exchange in Trenton in competition with the Cumberland Telephone Company.

W. T. Powell, who is engaged with the Mutual Automatic Telephone Company at Albuquerque, New Mexico, has been promoted and is now in charge of automatic switches and telephones, which includes supervision of everything furnished the above company by the Automatic Electric Company, Chicago.

J. J. Speed, manager of the Home Telephone Company at Springfield, Missouri, was recently in Chicago to purchase the necessary equipment and material to increase the capacity of the local exchange from 1,800 to 2,500 lines. Mr. Speed contracted for 47,000 feet of cable, new switchboard sections and telephones.

J. F. Barringer of Chicago, who attempted about a year ago to secure a concession for the establishment of an automatic telephone exchange in the City of Mexico, will return to Mexico, it is reported, within a short time. The purpose of his visit is not known, but it is believed that he may make another effort to get the concession.

William J. G. Lambert, representing the Home Telephone Company of Riverside, California, has acquired the franchise of J. U. Street for a telephone system in Riverside. The company is contemplating extensive additions to its service and is receiving bids for approximately $1,000,000 worth of material. The bids are for delivery on the Pacific coast. The headquarters of the company is Los Angeles. It is thought the intention is to extend the system to San Francisco.

J. K. Whittaker, treasurer of the Citizens' Telephone Company of New York city, has purchased the stock of the Northwestern Telephone and Telegraph Company at Carthage, New York. The Carthage exchange will be under the management of C. D. Warner, manager of the Citizens' Telephone Company of Watertown. Many improvements are contemplated.

J. G. Ball, late with the Central Electric Company, Chicago, will hereafter represent the Vought-Berger Company of La Crosse, Wisconsin, in the Dakotas, handling their interests and ranging the familiar field from Fargo, his home since a boy. The Vought-Berger Company is indeed fortunate in securing the services of so valuable a man as Mr. Ball to represent their interests.

C. P. Donnolia has been installed as local manager of the Northwestern Telephone Company's exchange at Stillwater, Minnesota, He is one of the men in the employ of the company who has earned promotion along civil service lines. R. H. Woolfolk, manager of the system there for the past four years, goes to St. Paul to take charge of the large system of the same company there. He is another man that has advanced in the service.

A. L. Hutchinson, president of the Independent Consolidated Telephone Company of Milwaukee, Wisconsin, is credited with the statement that within a year Milwaukee will have toll connections with all the Independent telephone companies in the state. The main line, now under construction, will connect the cities of Dubuque, Iowa, and Milwaukee, and will be used as a trunk line with which the other Independent companies may connect.

C. W. Sebern has resigned his position as manager of the Citizens' Telephone Company of Ashland, Kentucky, and has accepted a position as manager of the Park City Telephone Company of Bowling Green, and is now in charge of a large force constructing a line for said company, which, when completed, will be strictly up to date, with full metallic circuit and partly underground system. Rev. H. B. Smith has been elected manager to fill the place of C. W. Sebern, resigned.

C. C. Conroy of Beaumont, Texas, late owner of the Beaumont and Northwestern Telephone Company, has practically disposed of his telephone property to H. E. Huntington, it is said. The Beaumont and Northwestern has 500 miles of toll lines, sixteen exchanges and over thirty pay stations, covering the oil and lumber districts of east Texas. While in Galveston Mr. Conroy said that H. E. Huntington and associates are evidently seeking control of a telephone system that will encompass all Texas and perhaps other states.

Sam T. Johnson of Paton, Iowa, a graduate of the electrical engineering department of Ames, Iowa, has been chosen manager of the Green County Telephone Company's exchange at Jefferson, succeeding Purl C. Cockerell, who has been manager for the past year or more. Mr. Cockerill, who is an expert telephone construction man, will give his attention to the extention of the lines in which the Cockerills are interested in the northwestern part of the state. Mr. Elliott has been installed as trouble man to assist Mr. Johnson, taking the place of Will Wilkinson and Clifford Cockerill, who have been manager and Cockerill's assistants.

Malcolm Campbell of New York city, W. A. Wilbur, R. M. Gummere, B. P. Wilbur, E. M. McElvane and J. David Brodhead of South Bethlehem, James W. Fuller of Tatasauqua, M. B. Quinn of Philadelphia, Howard Mutchler of Easton and Charles M. Dodson and William B. Meyers of Bethlehem have organized the Easton and Bethlehem Telephone Company, which includes the lines of the New Jersey and Pennsylvania Company, the Warren Telephone Company, the Easton Telephone Company and the United States Long Distance Telephone Company. An exchange will be established at Bethlehem, also at Easton, Pennsylvania.

C. A. Prall, manager of the Topeka and El Reno Telephone Company at El Reno, Oklahoma, had his swimming ability tested in the raging waters of the South Canadian river recently. The telephone line crosses the treacherous river a considerable distance above the railroad bridge near Union City. Several poles were washed out, when the quicksand bottom began to shift in the big flood, and the line went down. Mr. Prall went out on the river in a boat with one of the linemen to see what could be done. The boat was upset and the occupants had all they could do to make their way to shore. The boat and tools went down stream and were lost.

H. E. Huntington has resigned as vice president of the Southern Pacific railroad, it is reported, and will hereafter devote himself to developing the Independent telephone system which he has recently organized in the southwest. The organization involves several millions of dollars, which has been subscribed in New York, and has already secured control of many of the most important Independent local exchanges in Texas, Louisiana, Arkansas, Indian Territory and Oklahoma. For preliminary work the company has appropriated $5,000,000 and is now inspecting the service in every possible way and a reduction in rates is expected to be announced soon.

XUM

IN THE RURAL LINE DISTRICTS

Arthur Gazely of White was rushing the telephone business here Saturday.—*Fountain Splashes in Brookings (S. D.) Individual.*

Our telephone line through here is all hunkadora. We hear no complaining whatever.—*Fairview Flickers in Unionville (Mo.) Journal.*

The farmers south of Rushmore have a very cheap telephone line, using a barb wire fence for a wire.—*Dewald Doings in Worthington (Minn.) Advance.*

We still have a wireless telephone in Texas, but hope by the end of the week our "Slippery Elm" route will be complete.—*Texas Letter in Wilmington (O.) Democrat.*

Bruce Byers of this place was reading the war news last Thursday when a telephone pole was struck by lightning, which ran into the house and damaged the telephone, then ran down the barrel of a

shotgun. Bruce fell out of the door. He thought a Jap was shooting at him and the shock nearly jarred the women off their feet in the kitchen.—*Johnsonville Jottings in Danville (Ill.) News.*

The telephone poles are being distributed around McHattie's corner and it will not be long before there will be a "hello" wire stretched all around.—*Stillwater (Minn.) Gazette.*

Kelowna can now boast of a telephone, Mr. Stirling having put up wires between his fruit farm and his office at the lake front.—*Kelowna Correspondence in Vernon (B. C.) News.*

The Brookings Telephone Company have their 'phones in out this way and the wires are kept warm most of the time, but it is a new thing now.—*Eureka Echoes in Brookings (S. D.) Individual.*

J. N. Rosser is pushing the telephone business lively and we may expect soon to be in direct communication with all the little suburban towns around Rush Hill.—*Rush Hill Ripples in Laddonia (Mo.) Herald.*

The Missouri and Kansas Telephone Company has placed a telephone in the postoffice at Pond Creek. Guess Delegate McGuire won't have any trouble satisfying all the applicants who apply for that office.—*Wichita (Kan.) Eagle.*

Telephones in abundance, only three coming into the neighborhood, which will not benefit the community as much as might unless they connect, for the neighbors cannot talk to one another.—*Eureka Etchings in Brookings (S. D.) Press.*

When the telephone is first put in every woman in the neighborhood knows how many chickens every hen within ten miles has hatched, and every one can tell when every one else got through washing the breakfast dishes.—*Beatrice (Neb.) Democrat.*

The switchboard for the local telephone exchange arrived Wednesday morning and it will be put in this week. It will now be only a few days until all connections are made and we can talk to and about our neighbors over the 'phone.—*St. Paul (Neb.) Republican.*

A number of telephone wires fell across the trolley wire in front of the *Evening Times* office, and for a few moments there was some lively skirmishing. The wires sizzled and bounded around the street as if possessed with seven devils.—*Warren (Pa.) Times.*

The telephone war on this and some other lines waxeth warm. Politics has taken a back seat for the time being. The principal argument advanced as far as we have learned is "it is, and it ain't," the same argument that has caused thrones to crumble, has swept whole nations from the face of the earth and turned this old world of ours topsy turvy.—*West Lick Whispers in Laddonia (Mo.) Herald.*

All one can hear nowadays is, are you going to have a telephone, and which one. They ought to have a meeting and all one neighborhood take the same, as farmers haul their grain to one town and do their trading in the other a great many times.—*Argo Items in Brookings (S. D.) Press.*

The "hello girl" at Nova will soon have more to do. A telephone line connecting this locality with Nova will soon be in operation. The line starts at Stanton Sponsler's. Fourteen subscribers will hook on between this place and the connection with other lines.—*Northeast Orange Notations in Ashland (O.) Press.*

The outside world can now "hello" to Balls Ferry all it wants to. The telephone boxes are now in and the people of this section can be called up at any time. The line to Cottonwood is nearing completion. Balls Ferry folk are tickled to death over this latest evidence of progress.—*Balls Ferry Bits in Redding (Cal.) Free Press.*

An agent of the Rural Telephone system has been canvassing our township, and nearly every farmer has subscribed, the rate being $15 for residences, and it is expected that they will soon be saying "hello" to each other. With rural mail, telephone, etc., the village folks will have to move out into the country to enjoy the city facilities.—*Richland Ripples in Galesburg (Mich.) Argus.*

The new telephone line connecting St. Clair and the farmers to the southward began business Saturday by getting crossed over the Citizens' line. In consequence there was a furore on for the time being, until the trouble man could separate the conflicting stories that buzzed back and forth. Every one took a hand in the fun. Now all is serene and when all get used to the new convenience there will be a ring only occasionally.—*Mankato (Minn.) Press.*

Brethren should dwell together in unity over the telephone if they can't do it over the line fence. Unless some of our people get more of the grace of God in their hearts telephone wires will soon melt down. Two of our German friends down toward Dysart got into such a dispute the other day that they burned out the fuse. As a result the company held a meeting and fined one of the offenders $5. It is better to think naughty words than to say them even over a telephone line, but better still not to think them.—*Traer (Ia.) Star-Clipper.*

Mr. Otto of the telephone company can go one better than anything that has so far been reported along the line of raising peas. He is growing some peas in his garden that have made the wonderful growth of five feet and two inches in length and are loaded with

fine large pods. He calls them telephone peas, and the ingenuity of Mr. Otto may yet devise some plan by which he may grow them long enough to be used in transmitting messages over the road. These big peas can be seen in Mr. Otto's garden.—*Grand Island (Neb.) Independent.*

Our residents had a chance to see some swift telephone pole climbing here Wednesday morning. After Pete Frandson succeeded in climbing a pole a week or so ago he got noisy, and no matter what argument he got into he would wind up with the remark, "Well, I don't care; you can't climb a telephone pole." He and Will Gunnell closed an argument that way and "Billy" wouldn't admit he couldn't, but put on a pair of spurs and went to the top of a pole and back in a little over sixty seconds. Two minutes later P. G. F. was up home, and he has been mum about his ability as a pole climber ever since.—*St. Paul (Neb.) Republican.*

INCORPORATIONS OF THE MONTH

ARIZONA.

PHOENIX—Johnson Electrical Manufacturing Company. Capital stock, $200,000. Incorporators, W. Frederick Nutt, Charles H Johnston and others.

TUCSON—The Consolidated Telephone, Telegraph and Electric Company. Capital stock, $2,500,000. President, Colonel Epes Randolph; vice-president and general manager, C. W. Hinchliffe, Los Angeles, Cal.; secretary, E. S. Ives.

CALIFORNIA.

SONOMA — Sonoma-Embracadero Rural Telephone Company. Incorporators, Robert Hall and others.

LOS ANGELES—The Pacific Coast Telephone Construction Company. Capital stock, $25,000. Directors, Charles F. Guthridge, Charles L. Zahn, Arthur Wright and others.

CONNECTICUT.

NEW HAVEN—Acme Wire Company. Capital stock, $100,000. Incorporators, Victor M. Tyler, New Haven; H. E. Flather, Rome, N. Y.; Edgar L. Haitpence, Newark, N. J.

GEORGIA.

QUITMAN — Hickory Head Telephone Company organized. President, C. H. Ramsey; vice-president, M. L. Stanley; secretary, L. W. McMullen; treasurer, D. C. Denmark; directors, J. W. Haddock, J. G. Stanley, Walter C. Jones.

ILLINOIS.

QUINCY—German Telephone Company. Capital stock, $500. Directors, A. Bartell, M. Gronewald, D. G. Buss and others.

WINDSOR—Windsor and Okaw Mutual Telephone Company. Capital stock, $900. Incorporators, John W. Herron, J. H. Harte, J. F. Morse.

WILLIAMSVILLE—The Williamsville and Sherman Telephone Company. Capital stock, $2,500. Incorporators, Charles M. Woods, Nathan Hussey, S. T. Jones.

INDIANA.

TALMA—The Talma Telephone Company. Capital stock, $5,000. Incorporators, S. J. Grove, Lou Grove, Omar C. Montgomery.

SHELBYVILLE—The Ross Township Mutual Telephone Company. Incorporators, Philip Roessler, George Ruff and Jacob Kull.

HARRISTOWN—Harristown Telephone Company. Capital stock, $14,000. Incorporators, A. B. Cramer, E. P. Norris and others.

IDAVILLE—Idaville Co-operative Telephone Company. Capital stock, $9,000. Incorporators, T. B. Grim, J. F. Royer. T. J. Melon.

SALEM—The Harrison Telephone Company. Capital stock, $400,000. Incorporators, Enoch Parr, J. W. Etzler, Lewis Williams.

FRANKTON—Farmers' and Citizens' Telephone Company. Capital stock, $10,000. Directors, Thomas Bromley, E. H. Phillips George F. Quick.

SOUTH BEND—Tritt Electrical Manufacturing Company. Capital stock, $15,000. Incorporators, B. E. Tritt, A. H. Calvert, Charles H. Kreighnaum.

VEVAY—The Farmers' Mutual Telephone Company of Switzerland county. Capital stock, $5,000. Directors, J. D. Forman, H. Wales, Robert Flatten.

WILMOT—Wilmot Mutual Telephone Company. Capital stock, $10,000. Directors, L. R. Gerard, G. F. Brenninger, Geo. S. Bouse Wilmot; Dr. J. W. C. Scott, Etna; H. F. Cline, North Webster; M L. Huffy, Cromwell; R. R. Scott, Wilmot.

INDIAN TERRITORY.

BROKEN ARROW—The Broken Arrow Telephone Company. Capital stock, $5,000.

IOWA.

ADAIR—The Grant and Audubon Township Mutual Telephone Company. Capital stock, $3,000.

PATON—Paton Mutual Telephone Company. Capital stock, $10,000. Chief incorporator, H. H. Smith.

KNIERIM—Farmers' Mutual Telephone Company. Capital stock, $5,000. Incorporators, G. W. Lowery and others.

STANHOPE—The Stanhope and Griffin Telephone Company. Capital stock, $1,000. Incorporators, John Griffin and others.

SHELLSBURG—Farmers' Mutual Telephone Company. Capital stock, $10,000. President, J. D. Hagen; secretary, J. S. Bosler.

STOCKPORT—The Farmers' Mutual Telephone Company. Capital stock, $10,000. Directors, R. M. Harlan, D. Morris and others.

SCRANTON—The Farmers' Mutual Telephone Company. Capital stock, $10,000. Directors, N. E. Christian, John Page and others.

PANAMA—Farmers' and Merchants' Mutual Telephone Company. Capital stock, $5,000. President, N. J. Roundy; secretary, Edward Higgins.

CASEY—The Casey Mutual Telephone Company. Capital stock, $1,500. President, A. M. Fagin; vice-president, C. L. Knox; secretary and manager, C. C. Jones; treasurer, S. L. Rutt.

OGDEN—Mercy Mutual Telephone Company. Capital stock, $20,000. Incorporators, John Olson, C. H. Williams, Simon Peterson, J. S. Miller, Charles Houstrom, A. B. Morgan, William Hiland, John S. Dixon, John Sparks.

KANSAS.

HOME—Home City Mutual Telephone Company. Capital stock, $2,100.

ARCADIA—The Arcadia Telephone Company. Capital stock, $5,000.

GOODLAND — Sherman County Telephone Company. Capital stock, $5,000.

SAVONBURG—Savonburg-Teanna Mutual Telephone Company organized. President, W. G. Taylor; vice-president, V. B. Richardson; secretary, Richard Blair; treasurer, O. D. Courtney; superintendent, Alfred Barnett; trustees, Charles Nelson, A. P. Wisborg, C. A. Reynolds.

KENTUCKY.

MOSCOW—Home Telephone Company organized. President, Dr. John Mahan; vice-president, A. B. Atherton.

RANDOLPH—Randolph and Hiseville Telephone Company. Incorporators, L. B. Strader, J. H. Owen and E. Evans.

HAZARD—The Big Leatherwood Telephone Company. Capital stock, $2,500. Stockholders, Arch Cornett, Jesse Morgan, B. P. Wooten.

WHITE PLAINS—The White Plains and Reu Hill Telephone Company of Hopkins County. Capital stock, $500. Incorporators, W. L. Moore, R. T. Gunn, B. F. Dukes.

MAINE.

PORTLAND—Independent Telephone Manufacturing Company, Portland. Capital stoock, $1,500,000. G. C. Knight, Portland, treasurer.

MICHIGAN.

HANCOCK—Automatic Telephone Company. Capital stock, $300,000. President, C. A. Wright.

MINNESOTA.

FAIRFAX—The Fairfax Telephone Company. Capital stock, $10,000. Directors, G. A. Reike, A. E. Fenskie and others.

WHEATON—Lake Valley Co-operative Local Telephone Company. Capital stock, $10,000. Incorporators, John A. Norsen, E. M. Blomquist, T. Heggen, Lars Larsen, Andrew Johnson, Frank Peterson, P. Johnson.

MISSISSIPPI.

SENATOBIA—Tate County Telephone Company. Capital stock, $1,000. Incorporators, J. F. Brewer, F. M. Bizzell and others.

MISSOURI.

BAY ST. LOUIS—Citizens' Light and Telephone Company. Capital stock, $40,000.

MAYVIEW—Mayview Telephone Company organized. President, udge E. S. Butt; vice-president, F. J. Bersch; secretary, G. H. Robins; treasurer, Otto Nolt.

CLAYTON—Suburban Telephone Company. Capital stock, $100,000 Incorporators, J. Percival Phelan, Wellston; James D. Houseman,

Ferguson; C. R. Black, Clayton; W. Lee Travers, St. Louis; H. W. Karrenbrock, Clayton.

GREEN RIDGE—Green Ridge Telephone Company. Capital stock, $4,000. President, Dr. O. W. Claybaugh; vice-president, Geo. E. Hollenbeck; second vice-president, Dr. H. A. Hite; secretary, R. A. Bennett; treasurer, Eugene Hellman.

ST. JOSEPH—Articles of incorporation of the Funston Long Distance Telephone Company have been filed in the office of the county recorder. The company will incorporate with a capital stock of $15,000. The directors and stockholders are Edmond B. Funston, Jesse G. Funston, J. J. Funston, Thomas J. Porter.

NEBRASKA.

GREELEY—Greeley County Telephone Company. Capital stock, $10,000.

FULLERTON—Citizens' Telephone Company. Capital stock, $10,000; paid up, $5,000.

OAKDALE—Cedar Mutual Telephone Company. Capital stock, $5,000, and the paid up capital, $2,000.

NEWPORT—The Farm and Home Telephone Company. Capital stock, $5,000. Incorporators, C. M. Thompson, C. E. Van Every.

LEIGH—The Leigh Independent Telephone Company organized. Preisdent, Herman Bauman; vice-president, Dr. Lowery; secretary, J. H. Peiper; treasurer, Walter Graves; superintendent, F. E. Bell.

NEW MEXICO.

ARTESIA—Artesia Telephone Company. Capital stock, $25,000. Directors, Harry W. Hamilton, Samuel P. Denning, James A. Cottingham of Roswell; John R. Hodges and J. Mark Smith, Artesia.

NEW YORK.

CORNING—Hornby Telephone Association. Capital stock, $2,000. Incorporators, H. T. Jumerson, A. C. Clifford, Corning; W. T. Davis, Hornby.

EAST RANDOLPH—East Randolph Telephone Company. Capital stock, $10,000. Incorporators, Rollin Dow, Nellie Dow, Isa D. Dow, East Randolph, N. Y.

AUBURN—Cayuga & Seneca Telephone Company. Capital stock, $20,000. Incorporators, E. Clarence Aiken, Frederick A. Mohr, Howard W. Fluhrer, Auburn, N. Y.

STAFFORD—Stafford Telephone Company. Capital stock, $3,000. Directors, Ja. Lathrop, James A. North, Henry E. Ganiard, Howard Bell, Charles J. Call of Stafford and George H. Tore.

PITTSTOWN—Pittstown Telephone Company organized. President, J. B. Cushman; vice-president, Stewart Humphrey; secretary, Ellery Newton; treasurer, H. T. Reed. Directors, Isaac Norton, H. T. Reed, J. B. Cushman, G. A. Rose, Stewart Humphrey, Merrett Hoag, Ellery Norton.

OHIO.

FREMONT—Bishop Telephone Company. Capital stock, $7,000.

CHATHAM—Chatham Mutual Telephone Company. Incorporators, A. B. Hurst, John Yoder, Jr., W. H. Ripley, D. A. Clapp, A. R. Clapp.

CARROLL—Carroll Telephone Company. Capital stock, $5,000. Incorporators, O. B. Brandt, J. P. Gundy, H. A. Brown, John W. Artz, T. P. Sylvan.

URBANA—Urbana Independent Telephone Company, organized by Adam Cook, George Pretorious, J. C. Schmalzried and others. Capital stock, $10,000.

PARIS—Farmers' and Merchants' Teelphone Company. Capital stock, $8,100. Incorporators, J. E. Wagner, A. S. Bair, Renken Downs, V. W. Sheakley.

FOSTORIA—West Millgrove Telephone Company. Capital stock, $3,000. Incorporators, W. W. Rosendale, J. P. DeWolfe, C. D. Stearns, J. C. Rhodes, S. S. Ghaster.

WREN — Wren Telephone Company. Capital stock, $10,000. Incorporators, J. L. Moses, L. M. Hassman, F. M. Lichtensliger, O. J. Herman, B. O. Jones, E. L. Sheets.

DEXTER CITY—The Dexter City Southwestern Telephone Company. Capital stock, $10,000. Incorporators, B. F. Worrall, G. W. Hutcheson, Adam Shriver, J. B. Hutcheson, L. D. Headley.

SALEM—Salem Township Rural Telephone Company. Capital stock, $2,000. Incorporators, H. A. Halverstadt, E. P. Aldridge, Homer Halverstadt, E. H. Simon, H. V. Zimmerman, J. W. Brinker.

OKLAHOMA.

FREDERICK—Southern Oklahoma Farmers' Telephone Company. Capital stock, $5,000. Incorporators, C. A. Smith, John O. West, B. F. Flowers, Frederick A. Noble and L. H. McConnell of Elma.

PENNSYLVANIA.

BROOKVILLE—The Red Bank Telephone Company. Capital stock, $10,000.

FINLEYVILLE—The Bethel Telephone Company. Capital stock, $5,000. Directors, William T. Phillips, James P. Wilson, Samuel T. Hamill, John Simmons, J. J. Snyder, James G. Holleran, Samuel F. Boyer, W. J. Anderson, O. C. Simmons, W. T. Simmons, Adolph Steding.

SOUTH CAROLINA.

ORANGEBURG—Star Telephone Company. Capital stock, $700.

TENNESSEE.

GREENBRIER—Greenbrier Telephone Company.

TEXAS.

HILLSBORO—Union Bluff Telephone Company. Capital stock, $250. Incorporators, G. H. Garrett, J. T. Daniels, R. L. Bookout, J. D. Bookout.

VIRGINIA.

MECHANICSBURG—Mechanicsburg Telephone Company. Capital stock, $5,000. President, J. Burton.

WASHINGTON.

ROCKFORD—The Rockford Telephone Company organized. President, C. S. Shepard; vice-president, G. Saunders; secretary, O. Sullivan.

WYOMING.

RED BANK—Red Bank Telephone Company. Capital stock $20,000.

ANNUAL MEETINGS.

GEORGIA.

SAVANNAH—The Georgia Telephone and Telegraph Company has elected the following officers for the ensuing year: President and general manager, W. A. Bisbee; vice-president, J. H. Estill; treasurer, C. S. Kenyon; secretary, W. V. Davis; directors, W. A. Bisbee, Leopold Adler, W. W. Mackall, J. H. Estill, Herman Myers, H. P. Smart, Jacob Paulsen.

ILLINOIS.

ALTON—The Farmers' Mutual Telephone Company has elected the following officers: President, J. S. Culp; vice-president, J. T. King; secretary, Joel Williams; treasurer, W. H. Cartwright.

PAXTON—The Central Telephone and Telegraph Company has elected the following directors for the ensuing year: R. Cruzon, H. B. Henderson, Frank Lindley, F. L. Hall, V. E. Johnson, C. H. Langford.

KEWANEE—The Kewanee Home Telephone Company has elected the following directors: W. I. Hobbs, Joseph L. Dunn, E. B. Long, A. C. Shoemaker, W. H. McMillan, F. A. Ellithorn, B. C. Allen, G. B. Thompson.

SAVOY—The Farmers' Telephone Association has elected the following officers: President, J. H. Dunlap; vice-president, T. N. Jordan; secretary, J. H. Noble; treasurer, W. H. Wisegarver; directors, J. M. Blaine, E. C. George.

FOSTERBURG—The stockholders of the Fosterburg-Wood River Telephone Company have elected the following directors: Edmund Beall, D. M. Kittinger, J. P. King, W. H. Cartwright, J. S. Culp, Samuel Harris, Albert Penning, Harry Thompson, Joel Williams.

GRANVILLE—The Granville Telephone Company has elected the following officers: President, W. B. Sill; vice president, A. D. Fisher; secretary, B. B. Blosser; treasurer, W. P. Magee; directors, C. M. Chase, John Kunkle, W. E. Hawthorne, C. W. Dysart, Olaf Matson.

INDIANA.

FULTON—The Fulton Telephone Company has elected the following officers: President, George Reutshler; secretary and superintendent, H. L. Becker; treasurer, Elmer E. Jackson.

TERRE HAUTE—The Citizens' Telephone Company has elected the following officers: President, W. P. Ijams; vice-president, Fred B. Smith; secretary, C. R. Duffin; treasurer, G. A. Conzman.

IOWA.

WALLINGFORD—The Wallingford Telephone Company has elected the following officers: President. O. O. Refsell; vice-preisdent, T. O. Sando; secretary, J. O. Kasa; treasurer, O. O. Anderson; trustees, Frank Irwin, I. S. Refsell, H. K. Groth.

STORY CITY—The Story City Telephone Company has elected the following officers for the ensuing year: President, A. M. Henderson; vice-president, J. E. Cagwin; secretary, T. T. Henryson; treasurer, P. C. Christainson; directors, J. E. Cagwin, A. M. Henderson, Joseph Marvick, E. L. Erickson.

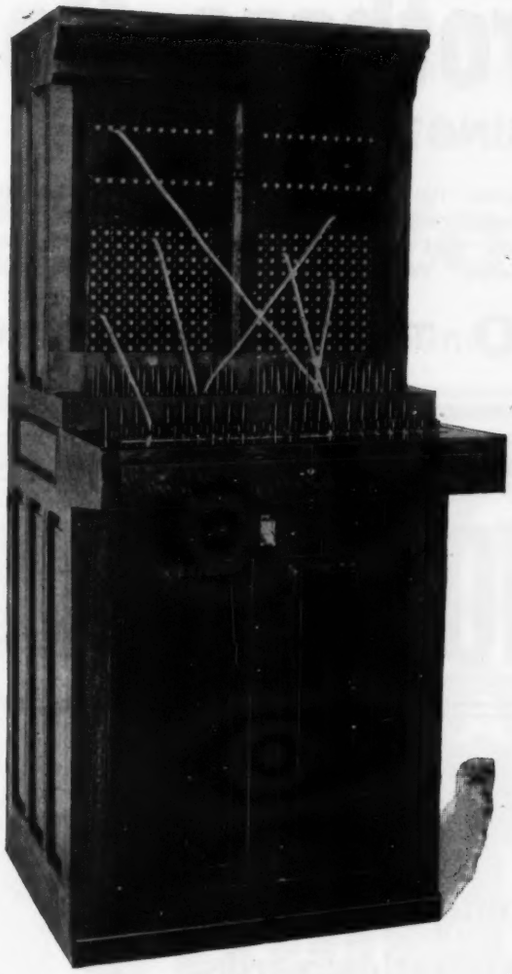
MADRID—The People's Telephone Company has elected the following officers for the ensuing year: President, T. R. Dresser; vice-president, J. S. Kennison; secretary and manager, Jno. Van Zandt; treasurer, Oscar Oakleaf; directors, Lewis Jesse, J. H. Pies, W. T. Roberts, E. P. Dalander, Ira Long.

Louisiana Purchase Exposition

EXHIBIT OF WORKING SECTIONS OF

THE FALLER SEMI-AUTOMATIC TELEPHONE EXCHANGE SYSTEM

WILL BE RUNNING BY JUNE FIRST



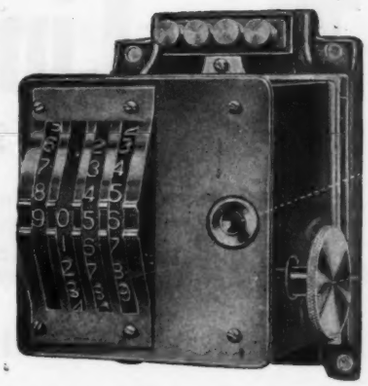
200 Line Standard Section Faller Semi-Automatic System.

and will demonstrate how this wonderful invention

Abolishes Multiples in Manual Switchboards

Enables telephone companies to give subscribers automatic service with their present manual boards.

Saves them over fifty per cent of the cost of operators.



This is the Sender used by both systems.

WE WILL ALSO EXHIBIT

a little later, a working section of the

Entirely Automatic Telephone Operator

which, unlike every other automatic telephone apparatus, is not of fragile construction, but is a handsome, compact, strongly made machine, run by power, not by magnets, which does the entire work of switching automatically, in the quickest, most perfect, certain and private manner.

This is the ordinary telephone instrument with Sender placed near it.

Both systems are Central Energy, give Selective Party Line service, and make trunked calls, complete, in four and a half seconds.

The Automatic and Semi-Automatic Systems work interchangeably.

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FACTORY:
772-776 Twelfth Ave., Foot of West 55th St., New York.

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The Lindsley Brothers Co.

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GENERAL OFFICE CHICAGO TRIBUNE BUILDING

CEDAR TELEPHONE POLES

Thoroughly seasoned.

Any length or size.

Immediate shipment.

Seven distributing yards.

Forty years' experience.

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CEDAR POLES

ALL SIZES FROM 16ft. to 70ft. for PROMPT SHIPMENT

We Own Large Tracts of Cedar Timber and Produce in Our Own Camps a Large Part of the Material we Handle.

WRITE FOR A COPY OF OUR TELEGRAPH CODE FOR CEDAR PRODUCTS.

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CHEBOYGAN,
ALPENA.

CEDAR POLES

TRADE MARK R&W

RABER AND WATSON

OLD COLONY BLDG. CHICAGO.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

WITTENBERG CEDAR CO.

WITTENBERG, WISCONSIN

PRODUCERS AND WHOLESALERS OF MICHIGAN AND WISCONSIN

CEDAR

POLES, POSTS AND PILING

Special Attention Given to all Inquiries and Shipments Made Promptly

WRITE US FOR OUR DELIVERED PRICES

White Cedar Poles

ALL LENGTHS AND SIZES

We are especially anxious to sell
4 in. 20 ft., 4 in. 25 ft., 5 in. 25 ft.,
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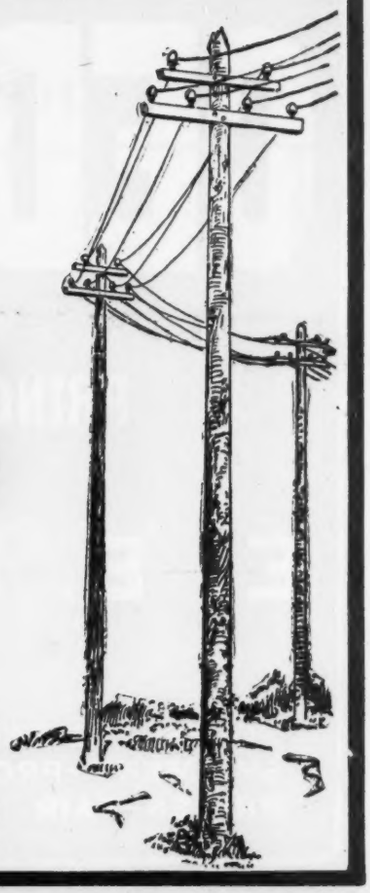

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FOR SALE—Telephone plant in Kansas; exchange and county toll line system. Operating conditions very favorable. Investigate this. Address 259, care of TELEPHONY, Chicago.

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SALESMAN WANTED—For general line of electrical supplies; experienced lamp salesman preferred. State previous experience. Give references. JULIUS ANDRAE & SONS COMPANY, Milwaukee, Wis.

FOR SALE—We have for sale a "Western" magneto switchboard and a large number of hand generators, all in good condition. Will be sold cheap. Write us for full information. SOUTHERN STATES TELEPHONE COMPANY, Norfolk, Va.

FOR SALE—All new telephone exchange. Owners have not enough money to develop properly. One hundred telephones installed, several country lines nearly completed and toll lines under construction. Nearby towns want exchanges. A snap if picked up at once. Address 260, care TELEPHONY.

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FOR SALE—The Ottumwa Telephone Company's plant at Ottumwa, Iowa, including franchise and all its property. The company owns the three story brick building, built two years ago, in which is installed a Central Energy System, equipped for 1,540 full metallic lines, with selective ringing apparatus, all of the latest and the best. 1,250 telephones are installed, with 250 names on the waiting list. The company also owns 80 miles of toll lines. This is one of the best telephone phopositions in the state of Iowa. For full particulars, maps and photographs, address the CITIZENS' SAVING AND TRUST COMPANY, Cleveland, Ohio, or Henry S. Herr, Ottumwa, Iowa.

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A Letter to Telephone Buyers

FROM A TELEPHONE BUYER

The contents of the following letter, written by Mr. M. M. Goodson is but one instance where **Andrae Telephones** are classed above all others. Mr. Goodson says:

JULIUS ANDRAE & SONS CO.,
Gentlemen:—"I enclose draft for $..... in payment of telephone No. 6A shipped me in April. I put this telephone on a line on which there has always been trouble, and took out a new ..... telephone that was not giving good satisfaction. The Andrae Giant telephone went to work like an old horse, and the first ring went clear through central. (We were on the end of the line.) Some of the other telephones on the line say it nearly tears their bells off. (Signed) MR. M. M. GOODSON."

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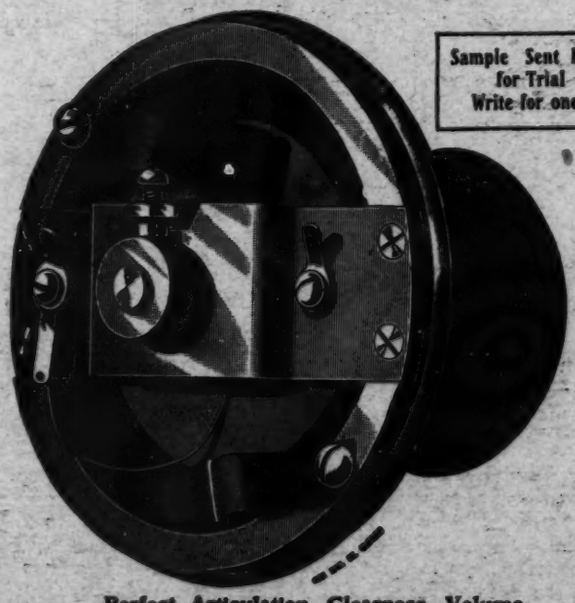

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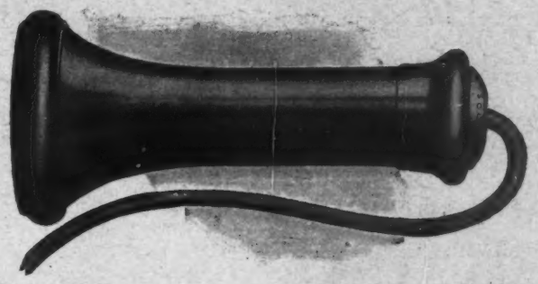

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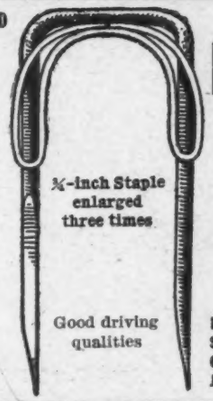

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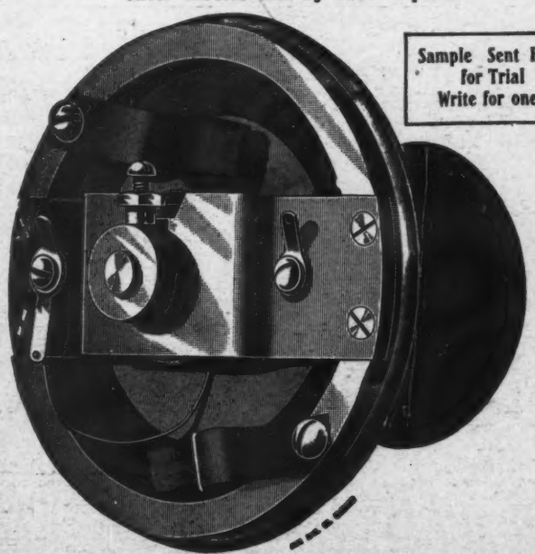

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